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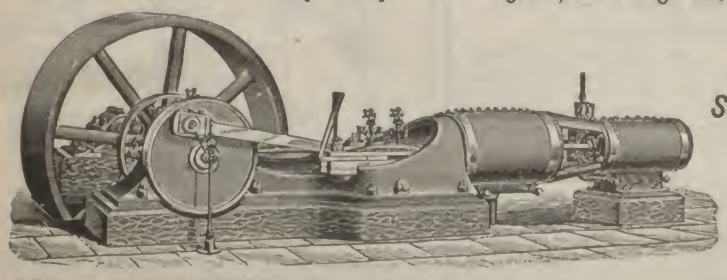

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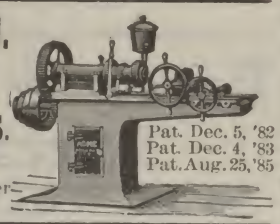

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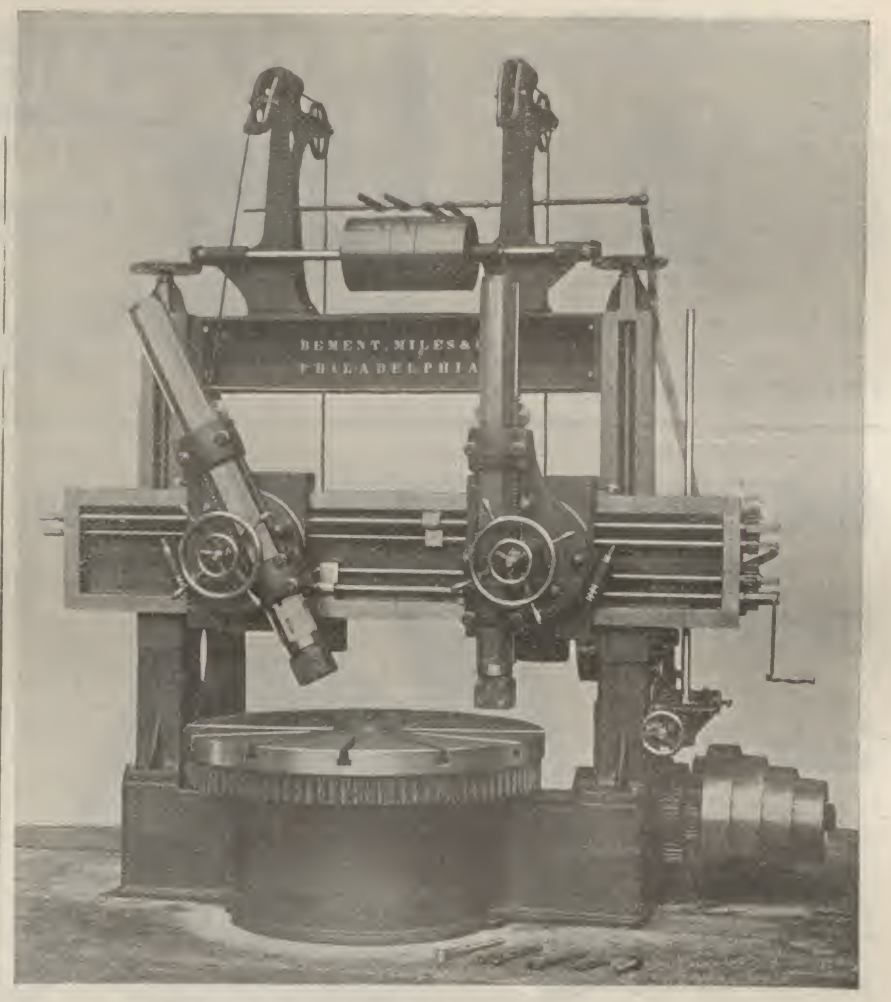

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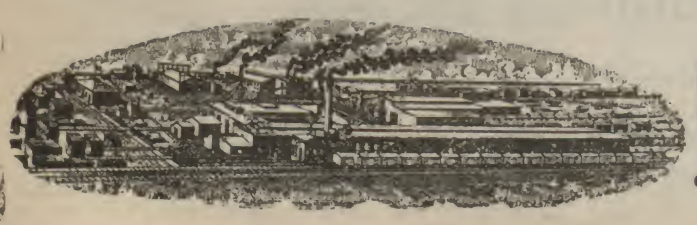

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THE RAILWAY REVIEW

XXXVI. MARCH 7, 1896. No. 10.

RAILROAD BUILDING IN THE SOUTH.—The number of small railroad lines in the south which have been built within recent years is remarkably large. Their owners are principally lumber and mining companies who have constructed them originally for carrying timber, ore, etc., to mills and furnaces or to some larger system to which they usually connect. The Manufacturers' Record has been compiling a summary of these private railroad lines in the southern states, which shows that about $11,500,000 capital is now invested in them, and that the mileage is very extensive. In North Carolina alone nearly 300 miles of such lines have been built. The longest private road is in Southeastern Texas. It is a tram road 75 miles in extent. In Kentucky, North Carolina, Texas and Georgia the investment of capital in these roads has exceeded $1,000,000 in each case. The figures given by the Manufacturers' Record show that the greater number have been very profitable, one line in North Carolina earning 10 per cent in annual dividends, while another company has built 15 miles of extension from the profits of 25 miles in operation.

DEMOLITION OF A BIG CHIMNEY.—Several thousand spectators attended to witness the recent demolition of a chimney at the Grove Paper Works, Bury Newroad, Manchester, England. The chimney was an octagonal one, 270 ft. in hight, measuring 27 ft. in diameter through the faces, and it is estimated that the total weight would be something like 4,000 tons. On the north side of the works the land is occupied with streets of cottage property, but towards the south was a stretch of vacant land, and it was in this direction that the contractor for the demolition proposed to arrange for the fall of the chimney. Accordingly, about one half of the base of the chimney was cut away on this side, the structure being supported by strong timber beams and uprights in the usual manner. When all was ready, these timbers, previously saturated with paraffin, were set on fire, and the chimney, after a slight preliminary lurch, gradually telescoped downwards, falling within a very limited area.

OVERCOMING IRON BRIDGE REVERBERATIONS.—Recently at a meeting of a German society of railroad men, a paper was read by Herr Boedecker on a "Means for the Prevention of Noise Caused by Trains Passing Over Iron Railway Bridges." The author had made a number of experiments, all of which proved more or less unsuccessful; but in the end a final and effective method was found, which consists of a decking of 1¼ in. planks between the cross girders, resting in 3 in. timbers, laid on the bottom flanges. On the plank a double layer of felt is laid, which is fixed to the vertical web of the cross girder; at the connections with the girder a timber cover joint is placed on the felt, and two hooked bolts connect the whole firmly to the bottom flange of the cross girder. A depth of 4 in. of slag gravel covers the decking, and the decking is inclined towards the center of the bridge, small tubes being inserted through the decking connected to a suspended gutter for drainage purposes; great care is taken that the felt is fixed accurately in the girders and drainage tubes, and an arrangement is made by means of which only water and no gravel can pass through into the gutter. A layer of felt is also laid between the planks and the timbers they rest upon, and the iron work in contact with the decking and ballast is well asphalted. The whole decking weighs 500 lbs. per lineal yard for a single line bridge, 11 ft. in width, and is stated to cost 23 cents per square yard. The result of this means for preventing noise has been so satisfactory that other bridges are being treated in the same manner; the decking has, moreover, proved water tight.

A UTILITARIAN AGE.—President Andrew H. Green, of the Commissioners of the State Reservation at Niagara, submitted a statement at the recent meeting of that body which is of a decidedly interesting character. Whether we agree with President Green that the spectacle which has made Niagara a familiar name through the world is in immediate danger, or whether that we admit that the industrial use of the water is of more importance to the welfare of the people than its undisturbed flow as a magnificent cataract, the magnitude of the enterprises which have fastened upon the water of the river above the falls cannot be disputed. In his presentation of the facts bearing on the matter Mr. Green claims that the great increase of projects to take water from the Niagara river that have already received legislative sanction, added to enterprises to utilize the more distant waters of the lakes, which waters are essential to the integrity of the falls, has become the occasion of a general apprehension that the spectacle of the falls is likely to be impaired. The following named companies now claim rights to take water from the Niagara river above the falls without any limit of quantity and without any compensation for it:

1. Lockport Water & Electric Co.; capital, $10,000,000.
2. Niagara County Irrigation & Water Supply Co.
3. The Lewiston Water Supply Co., capital not to exceed $50,000,000.
4. The Buffalo & Niagara Power & Drainage Co.
5. The Niagara, Lockport & Ontario Power Co., capital not to exceed $10,000,000.

Besides these are the following companies now actually drawing water from the river without paying one dollar to the state:

1. The Niagara Falls Power Co., originally chartered as the Niagara River Hydraulic Tunnel & Sewer Co., claiming the most monstrous powers under a remarkable series of legislative amending acts strewn through a series of years.
2. The Niagara Falls Hydraulic Power & Manufacturing Co., which now takes water from the river, is engaged without the slightest authority in enlarging its canal so that its flow capacity will be 462,000 cu. ft. per minute. It pays nothing to the state.

SOBRIETY IN THE SENATE.—For some time past very direct allusions have been made in certain of our eastern exchanges to the bibulous habits of more than one United States senator, charged with appearing in their seats in a condition bordering on helpless intoxication, says the San Francisco News Letter. Senator Morgan, of Alabama, is said to be the principal offender. It is alleged that he is rarely or never sober, and some very unhappy stories are told of his condition in Paris when attending the International Bi-metallic Congress. It is further charged that his colleagues have frequently feared to meet with him in committees, whose business has had to be postponed in consequence. The subject matter being alluded to by the New York press, led the Boston Herald to unwisely put in a plea for toleration in this wise: "Some of the greatest men of our country have had this habit of drinking heavily. It has gone into history as a weakness in their character, but the mantle of charity was always drawn over it by their contemporaries." This causes the New York Nation to wax indignant enough to say: "Well, the 'mantle of charity' was grossly misused when it was cast over this 'weakness.' Anyhow, whatever excuse a public man may have had for 'drinking heavily' fifty years ago, he has none to-day. If he cannot stop it, he ought to get out of public life. It is preposterous to make abstinence a condition of employment in an engineer of a locomotive, or in a captain of a liner, and allow a statesman, whose blunders may bring on a bloody war, to get drunk as often as he pleases, and then whine for the 'mantle of charity.' We believe we are the only civilized people to-day who allow men high in office to roll in the gutter with impunity." It makes the matter none the better that Senator Morgan is a leading member of the committee on foreign relations, and, until lately, was its chairman. If there be one place more than another where strict sobriety should prevail, it is in the committee charged with the issues of peace and war.

EUROPEAN EXPRESS TRAIN SPEEDS.—The following table, which has been compiled by the Journal of the Austrian Engineers' and Architects' Society, gives the speeds actually made by express trains in Europe up to date.

Route.	Time consumed.	Distance miles	Average speed, miles per hour	Difference in Standard time.
	H. M.			
1. London—Edinburg, via York, Newcastle	7 30	397.5	53	—
2. Berli —Hamburg	3 36	178.75	49.65	—
3. Paris—Lyons	7 28	320	42.86	—
4. Dublin—Queenstown	4 15	178.75	42.06	—
5. Paris—Bordeaux	8 12	365.62	42.02	—
6. Vienna—Budapesth	4 13	173.75	41.20	—
7. Vienna—Egar (Karlsbad express)	6 59	285	41.36	—
8. Berlin—Alexandrowo (Russian frontier)	6 14	250.62	40.20	—
9. Berlin—Vienna, via Breslaw, Oderberg	12 47	491.25	38.43	—
10. Berlin—Cologne, via Magdeberg, Braunschweig	9 32	360	37.83	—
11. Vienna—Lemberg	13 0	471.9	36.30	—
12. Ostende—Vienna, via Brussels and Cologne	23 35	825	35.40	60 min
13. Paris—Vienna, via Strassburg and Karlsruhe (Orient express)	24 5	840.62	34.87	55 min
14. Paris—Madrid (South express)	28 33	907.5	31.78	20 min
15. Vienna—Nice, via Venice and Milan	29 47	844.38	28.31	55 min

UNIQUE FEAT IN TELEGRAPHY.—The work recently done by the New York World in querying every bank of consequence in the United States as to its readiness and ability to subscribe to the new government bond issue was an object lesson in the perfection to which the telegraph service has been brought. The facts and the figures are astonishing. In carrying out the idea one or more messages were sent to every city, town and village in the United States that has a banking institution. To reach them all it became necessary to send 10,370 separate telegrams, and including replies, the grand total of message was about 17,500. The messages were sent out in two lots. It was decided to first sonnd the national banks. To reach them all it was necessary to send 3,698 telegraphic inquiries. This was done on Sunday night, January 5. The Western Union Telegraph Company had been notified that it would receive this great volume of extra business, and Night Manager E. F. Cummings, at the main office, detailed Frank B. Smith to personally attend to trafficking the business. At 6 o'clock in the evening the messages were delivered to the Western Union people. By midnight the last had been sent. The task of reaching the state and savings banks, trust companies and private bankers, which was undertaken five nights later, was twice greater than that of reaching all the national banks, for it was necessary to send out nearly twice as many messages—6,672. The work was commenced at 6 o'clock in the evening and by 2 a. m. every message had been handled. Every message reached the bank as soon as it was open for business. The great bulk of the answers came the morning after the messages were sent. It was a great undertaking. Never before had the Western Union Telegraph Company been called upon to handle such a great number of messages at one time by any one person or corporation. Mr. W. Rayens, the manager of the delivery department at 195 Broadway, handled the immense number of replies in such a manner as to call forth praise from the World for the prompt service.—[The Electrician.

OUR ENORMOUS STEEL PRODUCT. — The production of Bessemer steel in this country in 1895, as revealed by the statistics just published by James M. Swank, of the American Iron and Steel Association, amounts 4,909,128 gross tons. The record heretofore was 4,168,435 gross tons in 1892, but that was a year of unexampled activity. Still the known output of Bessemer pig furnishes some indication, in spite of the fact that we must ignore stocks and also the requirements of the open hearth plants. Roughly speaking, the product of the active part of last year, the second half, was about 2,800,000 tons, making a converting capacity in this country of over 5,500,000 gross tons. Mr. Swank estimates the open hearth output 1,000,000 gross tons in 1895, the record having been 784,936 gross tons in 1894. It is in this branch that capacity is expanding most rapidly, since the basic furnace has proven its capacity to crowd the acid converter on low cost of production for soft stock. A rough enumeration indicates that in 1895 there have been added to plant in this country not less than 30 furnaces, the majority of them of large capacity. These represent an annual tonnage of not less than 400,000 tons, and may reach 500,000 tons with the new plants now under contract or construction Upon this basis the Iron Age estimates that we have now in this country active capacity capable of dealing, when strained, with a total output of 7,000,000 gross tons of Bessemer and open hearth steel.

RELIABLE (?) ESTIMATES.—I believe that I made a reference a few months ago to the fact that it is usual in some establishments in making estimates for quotations on new work to figure a little and guess a good deal, observes J. H. Allen in Dixie. An engineer told me recently of an odd experience that he had had in that line not long ago. He had made the general assembled drawing for a new machine and it had been sent out to two parties, from whom bids were requested. After these had been received, the parties interested in the device concluded that it would be safer to supply the builders with a complete set of detail drawings, in order that the construction of the machine might be in exact accordance with the ideas of the owners. This was done and the manufacturers asked to revise their bids. Now, on the first estimate A had offered to do the work for $500, while B wanted $750. After the receipt of the details, A wrote that "inasmuch as an examination of the details shows that a great change has been made in the construction, and that the apparatus will be much more expensive to construct than the original drawing indicated, we shall be obliged to withdraw our previous offer and state that our price for the job will be $650." By the same mail there came a letter from B, in which he said: "We are pleased to say that upon an examination of the details just received, it is evident that your machine has been greatly simplified in construction, when compared with the drawings originally sent us, and we can therefore quote you $500 as the price for the work." As the shops had about equal facilities, it is very evident that some one did a little figuring and a great deal of guessing in one or both of these establishments; and the woods are full of just such styles of estimating.

SHAFT SINKING BY FREEZING.—When the Compagnie des Mines d'Anzin were about to sink two shafts near Vicq, quicksand was met with about 3 ft. below the surface; 20 ft. lower down followed a tertiary argillaceous sand, and under it a loose chalk with water, which threattened to break through the tertiary sand. Freezing was, therefore, resorted to. The shafts were to be 5 and 3.65 meters (about 16 and 12 ft.) in diameter. They were each surrounded by a ring of boreholes; the ring of the larger shaft had 20 ft. in diameter, that of the smaller, 17 ft. The 20 or 16 boreholes had a width of 10.2 in. A pipe was inserted in each borehole, and two concentric pipes, the inner 1.2, the outer 4.5 in. in width, were fitted into each of these pipes. The concentric pipes were joined to a ring above, communicating with the cold brine produced by a Linde ammonia machine. The cold liquid, a solution of calcium chloride, flowed down the inner pipe, and up in the space between the two to return to the cisterns. The plant comprised a twin 200 h. p. engine, driving by its flywheel and belting a four-fold Linde compressor, two Burton pumps to cool the ammonia and two more pumps of the same type to keep the brine in circulation which was cooled down to—4 deg. Fahr. About 2.5 cu. yds. of brine circulated every minute; the plant might have produced 10,000 lbs. of ice an hour. Over eight miles of pipes were wanted altogether. With the help of this plant the ground was frozen, and the shafts pushed lower and lower. They are now over 160 ft. deep.—Bulletin Soc. Internationale du Nord de la France.

RAFTING LUMBER.—It is reported that another attempt to raft lumber is to be made by Capt. H. R. Robertson, who built and engineered the transport of the cigar-shaped lumber raft, from Stella, Wash., to San Francisco, last year, after two failures in the same direction. He is now having timber felled for the building of three more rafts that will be put together next month and floated from Stella to San Francisco. They will be of uniform size, each 527 ft. long, 52 ft. wide and 30 ft. deep, drawing 20 ft. of water when floated and will each contain about 5,000,000 ft. of lumber, board measure. The lumber which includes piling and spar timber, saw logs and long timber of every description, will be packed in a cradle constructed for the purpose. The raft, when ready to be towed, will resemble a cigar in shape, flattened on the upper side, and tapering to a point at each end. When the logs are placed in the cradle, a large tow chain will be run through the center of the raft. To this will be connected other chains running herring-bone fashion, every 12 ft., fastened to other chains surrounding and binding the logs together the same distance apart. The reported cost of getting the last raft to San Francisco was $1,650, and even at that figure, it is much cheaper than the present means of transportation. Vessel men do not take kindly to the idea, for several reasons, one of which is that if this method proves popular and successful, it will take from them their business. More potent than that, however, is the fact that the unsuccessful attempts at rafting leave a great quantity of logs and timbers floating on the ocean, endangering vessels.

INTERNAL RUSTING.—Some of the best means of preventing the internal rusting of boilers while the boiler is working, as lately pointed out by a German authority on the subject, are, first, removing air from the feed water before it enters the boiler; second, removing air from the boiler while in the boiler, and preventing its accumulation in pockets, etc.; third, addition of chemicals to the feed water before it enters: and fourth, protective coatings applied to the inside of the shell. While the boiler is standing idle resort may be had to the following: First, removing all moisture from the boiler, either by blowing it out while hot, or by producing an air current through it, or by placing hygroscopic bodies inside; second, direct protec-

tion of the shells by painting with tar, varnish, etc., by covering with protective paints and such an alkaline coating as the milk of lime; third, protecting the shells from the varying temperatures by keeping the draft in the flues constant, thus preventing moisture being alternately deposited and evaporated on the shell, and fourth, protecting the shell by completely filling the boiler with water from which all air has been expelled. It is of decided advantage that the feeding should be complete before the withdrawal ceases for the day, in order that the water left standing in the boiler over night may be as free from air as possible; an efficient circulation is also to be considered among the means of preventing rusting, as it hinders the formation of air bubbles on the shell, which, if they remain clinging to it, cause rusting. Faulty construction is, however, more often the cause of internal rusting than are unfavorable conditions of making.—[Mechanical World.

Good Locomotive Mileage.

A statement of the mileage of fifteen class G mogul locomotives on the New York, Chicago & St. Louis Railroad, running between Conneaut and Buffalo, on what is known as the first district of that road, has just been received. This gives the mileage of each engine and the average of the fifteen for the month of December of last year, as follows:

	Miles
Engine 69	5,948
Engine 70	5,916
Engine 71	5,542
Engine 72	5,700
Engine 73, in shop 5 days	4,446
Engine 74	5,332
Engine 75	6,042
Engine 76	5,636
Engine 77	5,388
Engine 78	5,700
Engine 79	5,808
Engine 80, in shop 25 days	1,026
Engine 81	5,772
Engine 82	5,632
Engine 83	5,814
Total	79,702

Average, 5,313 miles per engine.

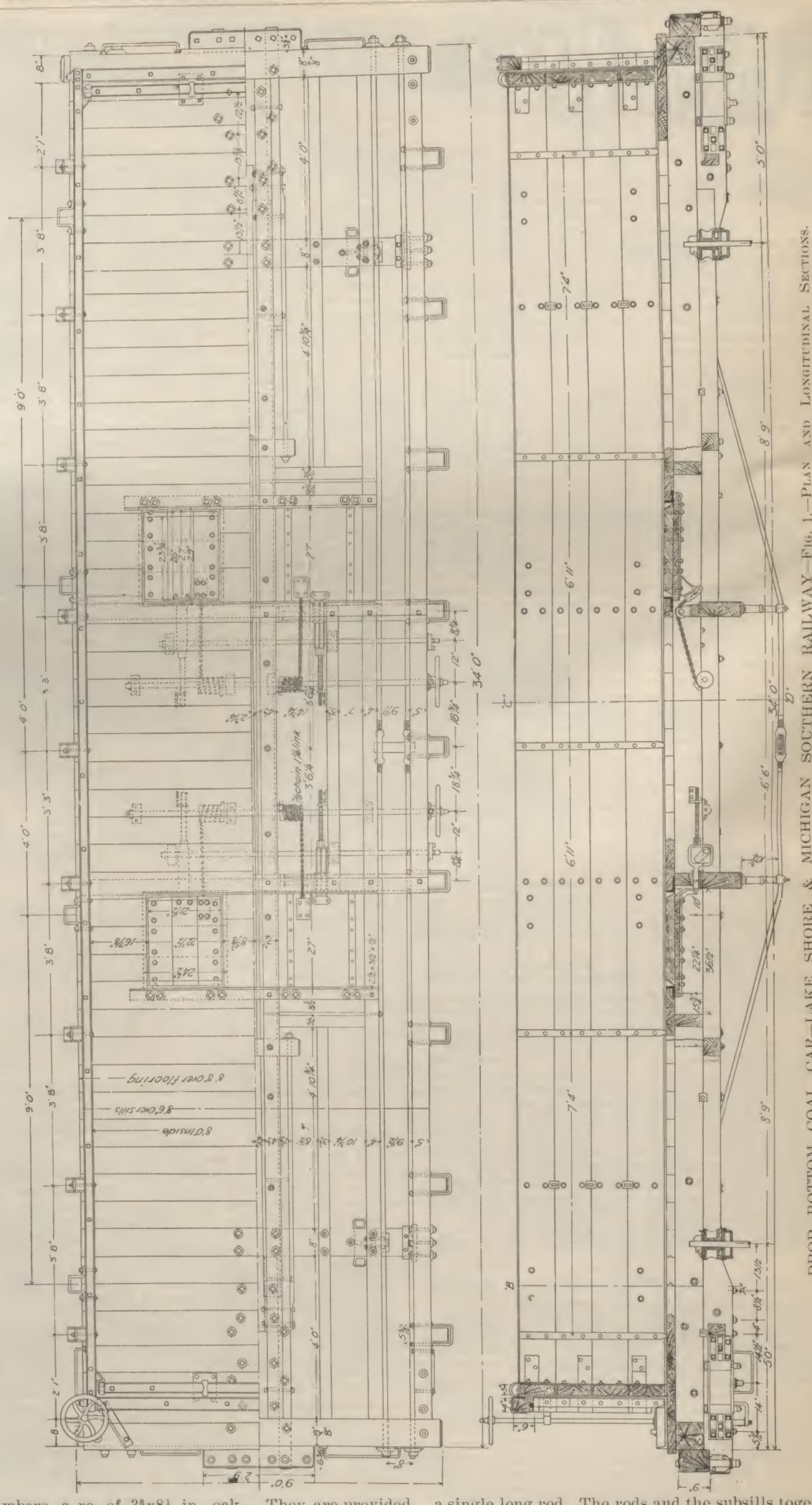
The total mileage of these engines for the year 895, was 782,152, and the average was 52,143 miles. These engines have 19x24 in. cylinders and weigh 100,000 lbs. in working order.

The average mileage of seventeen 17 and 18x24 in. passenger engines in 1895 was 63,358 miles. The average freight mileage of 95 engines for the same year was 44,383 miles, and the total average mileage of all engines numbering 148, including those on work trains and in switching and special service, was 43,873 miles. This last figure includes those engines which were in the shop for a part of the year. The fifteen mogul engines referred to were built by the Brooks Locomotive Works in 1888, and the record given above, as well as others which these engines have made, are remarkable, and indicate good workmanship, material and design.

THIRTY-FOUR-FOOT DROP-BOTTOM COAL CARS—L. S. & M. S. R. R.

Through the courtesy of Mr. A. M. Waitt, general master car builder of the Lake Shore & Michigan Southern Railroad, we are enabled to illustrate and describe the new 34 ft. drop-bottom coal cars of 60,000 lbs. capacity recently designed by him. This design is entirely new and that of the body is known as the class E 6, and that of the trucks class G 6. The length of the car over end sills is 34 ft. The length inside is 32 ft. 6 in. The width over side sills is 8 ft. 6 in., and 8 ft. inside. The hight from top of rail to top of box is 7 ft. 8⅛ in. The hight of the box inside is 3 ft. 6½ in. The drop-door openings are 2 ft. 3 in. long by 1 ft. 10½ in. wide in the clear. The hight from the top of the rail to the center of the coupler is 34½ in. There are four drop-doors placed 17½ in. apart across the car and with a space of about 7 ft. between the doors lengthwise of the car. The general arrangement of the under frame is shown in Fig. 1, which presents a plan of the floor one-half of which shows the sills and the other half the floor itself with the doors. In addition to this a longitudinal section of the car through a pair of doors is shown in this drawing.

The side sills of the car are 5x12 in., of yellow pine. The center and intermediate floor timbers are of the same material, the center timbers being 4½x8 in. and spaced 5½ in. apart. The outside intermediate sills are 4x8 in. and are spaced 9½ in. from the inside faces of the side sills. The inside intermediate sills are 3½x8 in. spaced 11 in. from the center floor timbers. The drop-door sills are mortised into the outside intermediate and the center sills. The end sills are of white oak 8x8 in. The arrangement of the longitudinal and the end sills may be seen in Fig. 2, which gives an end elevation of the car and also sections on lines *ab* and *cd* of Fig. 1. The cross-tie timbers are 4½ x 12 in. spaced 6 ft. 6 in. apart. The body bolsters are of wrought iron, the upper member being ¾x8 in. and the compression member ⅞x8 in. The truss has a depth of 5½ in. between the inside faces of these plates. The ends of these plates are bolted to cast iron pockets which are secured to the side sills with three ¾ in. bolts. These pockets also act as saddles for the outside truss rods. The center plates are of pressed steel. The body truss rods are 1⅛ in. in diameter and the bends are required to be 1 in. clear of the saddles and bearings. The draft



DROP BOTTOM COAL CAR—LAKE SHORE & MICHIGAN SOUTHERN RAILWAY—FIG. 1.—PLAN AND LONGITUDINAL SECTIONS.

mbers a re of 3¾x8½ in. oak. They are provided with two cast iron draw-bar stops and malleable iron draft timber guards. Directly above each draft timber a 6 in. re-enforcing timber 2½ in. x 8 in. x 6 ft. 4 in. long is framed into the end sill and bolted to the center sill. The deadwoods are of white oak, as are also the draw-bar stop timbers. The latter are 4x8½ in. and extend from the back draw-bar stop to the lip of the center plate. The back end of the stop timbers are notched out to receive the subsills. The subsills are of yellow pine 5x5 in. They extend under the center sills from end to end of the car, and are made in comparatively short sections, between which are passed the cross-tie timbers, and also two short pieces called draft rod cross timbers. These latter members, as shown in Fig. 1, receive the ends of two rods which are attached to the sides of the draft timbers by means of bolts. These rods carry pulling stresses from the draft timbers to the short pieces referred to, and the two draft rod cross-timbers, are connected together by means of one rod of 1¼ in. iron, which passes between the center sills and thereby is kept out of the way of the drop-doors and their attachments. This arrangement gives the advantages of a continuous draft rod without the disadvantages of a single long rod. The rods and the subsills together transmit the buffing and pulling stresses directly from one end of the car to the other. In connection with the draft gear the Gould automatic coupler is specified.

The drop-doors are made of double thickness of tongued and grooved plank and are made flush with the floor of the car when closed. They are each hung upon two hinges, the strap portion of which extends clear across the door. The hinge bearings are of 2x¾ in. iron, which pass up through an angle. The edges of the door openings are protected by angle irons. Each door is provided with an unlocking and winding shaft. The unlocking shafts have squared ends projecting through the outside faces of the side sills, and the winding shafts have a cast iron wheel on their outer ends to be used in winding up chains for raising the doors to their closed positions. The plan view in Fig. 1 shows the location of the shafts, the arrangement of the chain for winding up the doors and the manner of attaching the chains to the doors. The sectional view shows the arrangement of the latch, the finger for operating it and the spring whereby the latch is closed under a casting which is carried upon the lower face of the

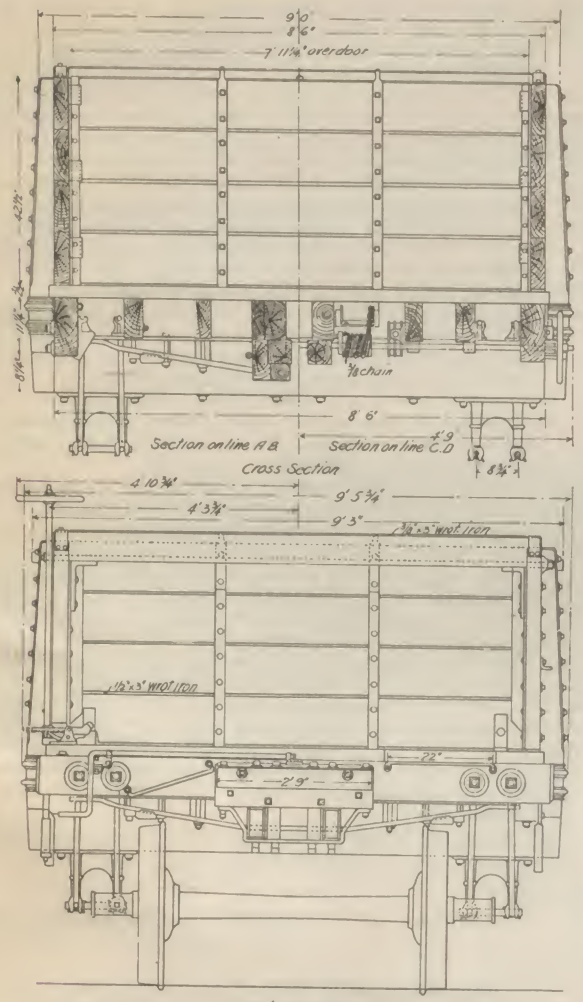


Fig. 2.—END VIEWS.

door. In this view an elevation is given of the casting by which the chain of the winding arrangement is secured to the door, showing a series of holes into one of which the last link is closed. The castings of the latch and winding arrangements are of malleable iron. The position of the roller over which the raising chain passes should be noted.

Each side of the car has nine stakes of white oak passing through malleable pockets secured to the side sills with U-bolts. The stakes which come opposite the needle beams are extended downward to the lower edge of these timbers in accordance with the suggestion made at the Alexandria Bay convention of the M. C. B. Association with reference to the strengthening of coal car sides. The car is provided with end doors hinged at the top. The cars are equipped with Westinghouse automatic freight air brakes with release and pressure retaining valves. The turnbuckles for the truss rods and brake connections are of the Cleveland City Forge & Iron Co.'s manufacture. The hand brake shafts are at the left hand corner of the car, as seen, facing the end, and are applied at one end only. The brakes are inside, hung from malleable iron brackets secured to the spring plank, as shown in Fig. 3. Each brake beam has two safety chains. The air brake hose is furnished by the Peerless Rubber Manufacturing Co. The National hollow brake beams and M. C. B. standard Christie shoes are specified.

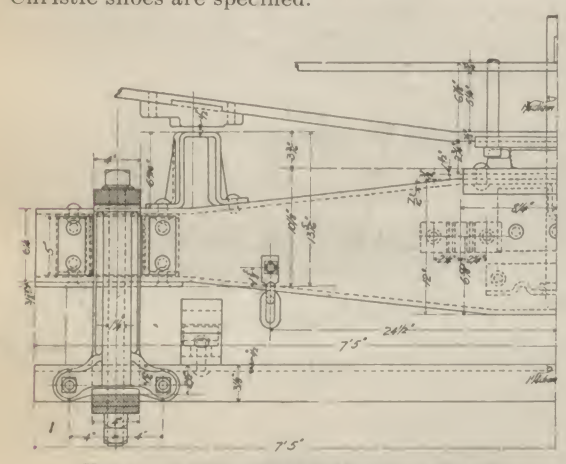


Fig. 4.—HALF SECTION OF TRUCK.

The construction of the truck is shown in Figs. 3 and 4. The bolster is of the Schoen type furnished by the Schoen Manufacturing Co. The side frames are the diamond pattern with the lower bar straight. The most noticeable feature about the arch bars is the large radii to which the members are bent. This is for the purpose of preventing cracking of the arch bars due to confining the stresses to a short length of the bar, which is done when the bends are made at or close to the castings to which they are secured. The spring plank is a 12 in. channel with a ½ in. web and 3½ in. flanges weighing 30 lbs. per foot. These are placed with the flanges downward and they are notched to receive the arch bars, which are 4 in. in width. The bolster guard bars are of malleable iron, as are also the journal boxes. The Soule dust guards are used. The axles are made by the Carnegie Steel Co. on specifications furnished by the railroad company. The drawings of the car and also the specifications indicate that great care was taken in the design, and a special effort has been taken to secure strength and durability as well as convenience in handling. The mechanism for handling the doors is new and it is so arranged as to permit the doors to open when the latches are removed without the necessity of slackening the chains by hand, and the latches will hold the door closed automatically when they are brought into the proper position.

THE JOINT TRAFFIC AGREEMENT.

Appended hereto will be found the report of the committee on railway transportation of the New York board of trade and transportation, adopted February 19, 1896, in connection with the much discussed agreement of the Joint Traffic Association.

Your committee on railroad transportation respectfully report that the new joint traffic arrangement between the principal railroads east of the Mississippi and north of the Ohio has now been in operation a month, and has apparently worked for the mutual interest of the public and the railroads. That there is a mutual interest no student of the transportation question can deny. It is true that rates may be too low as well as too high for the public interest, and that the public is best served by reasonable, uniform and stable rates. While there may be a few shippers who may for their own interest prefer "a chaotic condition of affairs", the great majority prefer an administration of our transportation lines described by the above three words, and hence favor any arrangement, whether under the name of joint traffic association, or a pool which will insure these conditions.

There is no longer any danger in this country of excessive charges for transportation. The competitive conditions, underlying which is our unrivalled system of waterways, insures in this country lower rates for transportation than any other country in the world. This is illustrated by the following figures from the advance report of Interstate Commerce Commission, dated Dec. 1, 1895, and from other reliable sources. "The average charge for sending a ton of freight one mile on thirteen of the most important railroads in the United States during 1865 was 3.08 cents; in 1870, 1.80 cents; in 1875, 1.36 cents; in 1880, 1.01 cents; in 1885, 0.83 cents; in 1890, 0.77 cents: in 1893, 0.76 cents.

These railroads performed one-third of the entire transportation in 1895, and from the figures given it appears that 0.76 cents would pay for as much transportation over their lines in 1895 as could have been obtained for 3.08 cents 28 years earlier.

This reduction, amounting to three-fourths of the average rate of 1865, was exceeded by that in price of but few even of those articles in the manufacture of which new inventions have worked the most radical changes.

The entire transportation performed by the railroads of the United States during the twelve years ending June 30, 1894, was equivalent to moving 136,799,677,822 passengers and 807,935,382,838 tons of freight one mile. Had rates averaging as high as those of 1882 been collected on this traffic the railroads would have earned $2,629,043,459 more than they actually received in these twelve years.

The total amount of reported railroad capital on June 30, 1894, was $10,796,473,813, or $62,951 per mile of line. Of this $4,834,075,659 was capital stock, while the funded debt represented by bonds and other securities was $5,-356,583,019. The amount of stock paying no dividend was $3,066,150,094, or 63.43 per cent of the total amount. The amount of bonds paying no interest was $650,573,789, or 14.17 per cent. The amount of miscellaneous obligations paying no interest was $53,426,264, or 11.71 per cent, and the amount of income bonds paying no interest was $210,-757,554, or 86.94 per cent.

During the three years ending December 31, 1894, receivers were appointed for railroads having a total length of 46,875 miles, capitalized at $2,534,529,000, and 9,078 miles, capitalized at $494,821,000, were sold under foreclosure, wiping out or readjusting these investments. From January 1 to July 1 of 1895 these totals were increased 2,409 miles, capitalized at $149,615,000, and 2,396 miles, capitalized at $100,941,000, which respectively went into the hands of receivers and were sold under foreclosure.

The year ending June 30, 1894, showed the income of railroads in a section including 52 per cent of the railroads of the country did not produce enough above the actual cost of operation to pay their fixed charges during that year.

These statistics of diminishing returns to investors, financial disasters and widespread insolvency clearly indicate that the present railroad charges are not too high, unless it is desirable to reduce all the railroad corporations to the condition of uniform and hopeless bankruptcy, even if they do not demonstrate, as might be urged with some evidence of justification, that the returns now produced by railroad rates are actually lower than is reasonably just or to the interest of the general public. The frequent failure of railroad enterprises to prove remunerative results in the difficulty to secure capital for the new and often much needed lines, and in the exaction of conditions which afford at least a chance of extraordinary profit as an offset to what is regarded as the hazardous nature of the investment. This opportunity for large returns often takes the form of an excessive discount on the securities offered, or what is much the same thing, a large stock bonus to accompany sales of bonds, this being amongst the most frequently deprecated methods of "stock watering".

But few persons appreciate the importance of the railroad industry to all the material interests of the United States. Without it vast tracts of fertile land would remain unproductive for lack of a market. It touches the industries of the country at every point. The number of railroad employes in the United States in 1893 was about 874,000 men. Owing to severe depression in the railroad business, this number in 1894 had fallen to about 780,000. Not only was an army of 100,000 men forced out of employment, but there was a general cut of wages in all grades of the service. Five thousand general officers suffered, as well as 180,000 trackmen and 150,000 shopmen, and about 500,000 other employes. Wages were lowered directly, and time was reduced by the same result indirectly. Industries depending on the railroads as buyers experienced a lack of demand, and in turn were forced to curtail the working forces or reduce wages, and many millions of people, besides those actually discharged and their dependents, found themselves less able to buy the necessaries of life.

From this it will be seen that the public are interested in not having rates for transportation too low as much as they are that they shall not be too high, or that they shall not unjustly discriminate between shippers or sections.

In conclusions, we respectfully submit the following resolution:

"Resolved, That shippers should co-operate with carriers, and carriers with shippers, to maintain reasonable, uniform and stable rates of transportation, and to this end we invoke a fair trial of the Joint Traffic Association." (Signed)

F. B. Thurber,
Seth E. Thomas,
John A. Elmendorf,
Charles H. Patrick,
Oscar S. Straus.

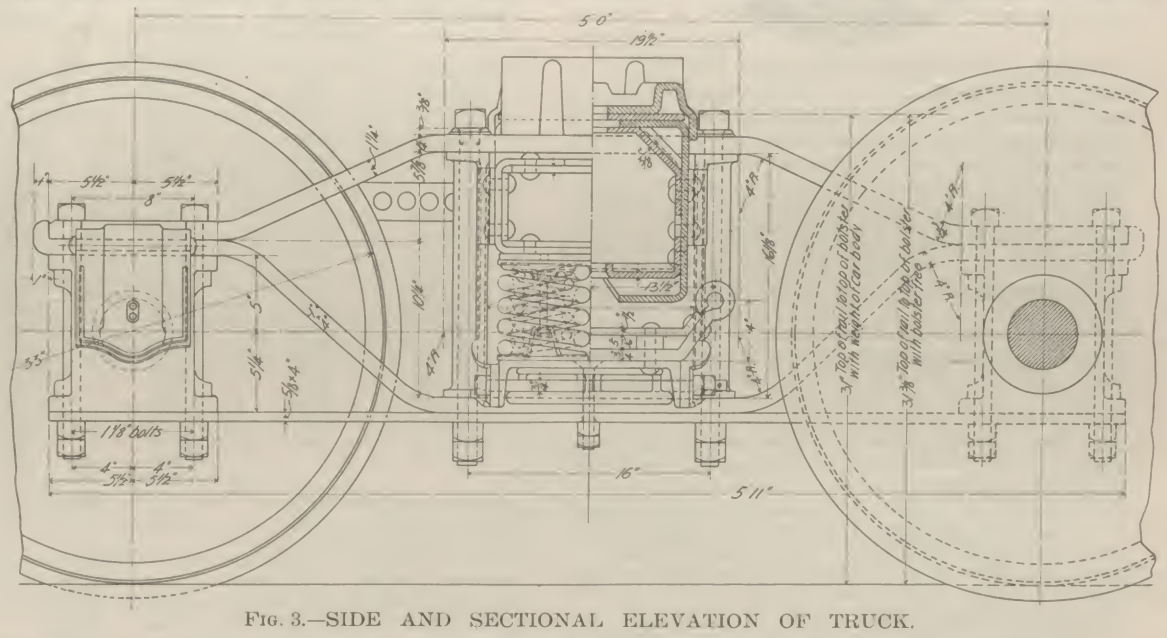


Fig. 3.—SIDE AND SECTIONAL ELEVATION OF TRUCK.

FLAWS IN STEEL AS SHOWN BY THE MICROSCOPE.

Attention has been recently called in England to mysterious fractures of steel by an accident to the Scotch express at St. Neots on the Great Northern Railway on Nov. 10, of last year. This was caused by the fracture of a steel rail into many pieces. The subject of these unexplained accidents has been taken up by Mr. Thomas Andrews of the Whortley Iron Works near Sheffield, England in the columns of a recent issue of "Engineering" of London to which journal we are indebted for the accompanying illustrations and the following paragraphs.

The author having for many years past devoted his attention to the microscopical study of the latent causes of the deterioration of fatigue in metals, when under the influence of stress and strain thinks it may perhaps at the present time be of interest to give the results of a recent microscopical observation on a steel rail (not the rail which broke at St. Neots) and on a large steel propeller shaft. The high power examination resulted in the detection of numerous unsuspected internal causes of weakness; in the special cases just referred to, the initial source of danger was referable to the presence of innumerable micro-sulphide of iron flaws. These microscopic segregations of sulphide of iron form the germs of metallic disease in numerous engineering constructions of steel, such as propeller shafts, railway axles, rails, tires, boiler plates, etc

By means of his special high power microscopical apparatus the author has in many instances been able to locate

and pursue an internal flaw in steel from its source to its various ramifications, and he has recently obtained much valuable information on some of the causes producing the deterioration of fatigue and final fracture of propeller shafts, railway axles, etc.

In addition to blow holes, air cavities, and other causes of weakness, the microscope has recently revealed a further source of internal and growing flaws in steel axles and shafts, heavy guns, etc. A careful microscopical examination of steel in which sulphur is present shows that the sulphur is combined with the iron, forming a sulphide of iron. During the cooling and crystallization of the metal the sulphide of iron present has been found by the use of high microscopic powers to have chiefly located itself in the inter-crystalline spaces forming the ultimate structure of the metal. In steel castings the sulphide of iron is mostly found in long thin veins in the inter-crystalline spaces. In large forgings or other steel structures which either have been reheated or annealed at suitable temperatures, the sulphide of iron often segregates, drawing itself together as it were into ovoid nodules. The inter-crystalline spaces thus left vacant either metallically weld together, if the temperature of subsequent heating or annealing is sufficient, or they remain as fine fissures forming sources of internal weakness in the metal. This becomes a constant source of weakness, increasing or diminishing in proportion to the percentage of sulphur present

Fig. 1.—Fractured Steel Rail, Magnified.

in the metal. It is, however, rarely wholly absent in steel. Such interference with the natural cohesion between the ultimate crystalline facets of the metal has a tendency to induce serious lines of internal weakness in the structure, and constitutes an element of danger. These internal interferences with the natural inter-crystalline spaces are frequently very minute, and in fact are undetectable by the eye; but when specially prepared and etched sections of the steel are examined under high microscopical powers, these minute sources of initial weakness are observable.

The deleterious effect of these treacherous sulphur areas and other microscopic flaws, with their prolonged ramification spreading along the intercrystalline spaces of the ultimate crystals of the metal and destroying metallic cohesion, will be easily understood.

Constant vibration gradually loosens the metallic adherence of the crystals, especially in areas where these micro-flaws exist. Cankering by internal corrosion and disintegration is induced whenever the terminations of any of the sulphide areas or other flaws in any way become exposed at the surface of the metal, either to the action of sea water, or atmospheric or other oxidizing influences. In many other ways, also, it will be seen how deleterious is their presence.

Internal micro-flaws of various character are nevertheless almost invariably present in masses of steel, and constitute sources of initial weakness which not unfrequently produce those mysterious and sudden fractures of steel axles, rails, tires and shafts, productive of such calamitous results. A fracture once commencing at one of these micro-flaws (started probably by some sudden shock or vibration, or owing to the deterioration caused by fatigue in the metal), runs straight through a steel forging on the line of least resistance, in a similar manner to the fracture of glass or ice.

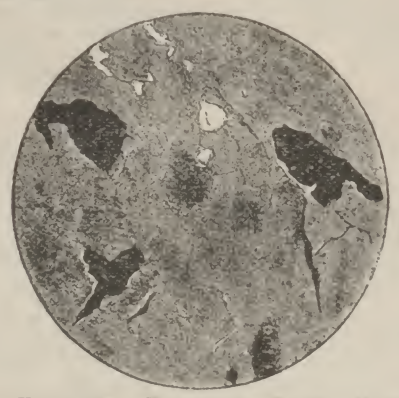


Fig. 2.—Fractured Propeller Shaft, Magnified.

The Bessemer steel rail referred to in this paper was of the hemical composition given in Table I.

Table I.—Chemical Analysis of Bessemer Steel Rail. Percentage Results.

Combined carbon	0.440
Silicon	0.040
Manganese	0.800
Sulphur	0.100
Phosphorus	0.064
Iron (by difference)	98.556
	100.000

A portion was machined from the head of the rail and a micro-section was carefully prepared and suitably etched to develop the structure. The microscopical examination was made with a first class microscope, the magnifying powers employed varying from 300 diameters and upwards. For convenience the micro-scale drawing, Fig. 1, is given at 300 diameter.

In explanation, it may perhaps be desirable briefly to explain the illustrations in Figs. 1, 2 and 3. The black and heavily shaded (for convenience) portions of each drawing are the internal mico-flaws, the lighter shaded parts are the ultimate primary crystals composed of distinct and detached crystalline areas of iron, saturated to various extents with combined carbon. These may appositely be called normal carbide of iron areas or crystals, as distinct from the pure iron crystals (or ferrite) of the metal. The unshaded portions of the drawings consist of crystals of pure iron, or ferrite, which have not been affected, or but very slightly, by the carbon. The fine divisional lines in the figures show the line of junction or inter-crystalline

Fig. 3.—Fractured Steel Propeller Shaft, Magnified.

spaces between the ultimate crystals of the metal. Numerous unsuspected internal micro-sulphur flaws were found varying in size from 0.015 in. downwards, interspersed or segregated in the inter-cyrstalline junctions of the ultimate crystals of the steel, and being located in such a manner as to prevent metallic cohesion between the facets of the crystals, thus inducing lines of internal weakness liable to be acted upon by the stress and strain of actual wear.

Table II.—Dimensions of Internal Micro-Flaws In a Bessemer Steel Rail and in a Steel Propeller Shaft.

Bessemer Steel Rail. Section 85 lb. per yard.		Steel Propeller Shaft.	
Longitudinal Dimensions of Internal Micro-Flaws.	Transverse Dimensions of Internal Micro-Flaws.	Longitudinal Dimensions of Internal Micro-Flaws.	Transverse Dimensions of Internal Micro-Flaws.
Dimensions in parts of an inch.			
.0150	.0012	.0090	.0004
.0120	.0010	.0060	.0020
.0012	.0006	.0140	.0002
.0012	.0004	.0120	.0024
.0010	.0006	.0030	.0020
.0010	.0006	.0048	.0012
.0008	.0004	.0040	.0024
.0012	.0004	.0160	.0030
.0010	.0004	.0020	.0016
.0030	.0002	.0068	.0028
.0012	.0006	.0034	.0010
.0016	.0008	.0120	.0002
.0016	.0004	.0030	.0020
.0008	.0004	.0030	.0028
.0016	.0006	.0120	.0010
.0012	.0004	.0060	.0016
.0010	.0006	.0066	.0008
.0020	.0006	.0032	.0026
.0010	.0004	.0028	.0026
.0016	.0004	.0026	.0016
		.0040	.0010
		.0048	.0020
Highest, .0150	.0012	.0160	.0030

About 20 careful micrometer measurements were taken of many of these micro-sulphur flaws, some of which are given in Table II.

These do not, however, nearly represent the full quantity present. The number in some areas was at least 14 micro-flaws within the limited area of only 0.00018 square inch.

The author has recently completed another high power microscopical examination of a fractured steamship steel propeller shaft, the failure of which nearly produced a most disastrous accident. The examination of this propeller shaft was conducted in a similar manner to the above description, the result revealing the undoubted cause of failure. In addition to blowholes, air cavities, etc., the interior of the shaft was literally honeycombed with micro-sulphide of iron flaws, which were meshed about and around the primary crystals of the metal in every direction. The deleterious effects of an excess of manganese in interfering with the normal crystallization of the normal carbide of iron areas were also perceptible.

A chemical analysis of portions cut from the outside periphery of the propeller shaft compared with the results of an analysis of the metal in the interior of the shaft, showed that a wide difference of chemical composition existed in the forging. The impurities present had largely segregated during the cooling of the mass of metal, and these impurities were found in the interior of the shaft greatly in excess of the quantity found in the metal near the outside.

The percentage of combined carbon was nearly 50 per cent greater in the inside of the shaft than on the outside, the manganese was also in excess in the inside of the shaft the phosphorus and sulphur had also segregated in the interior of the shaft to nearly three times the percentage of these elements found near the outside of the shaft.

The high power microscopical examination further revealed the vast microscopic segregation of the sulphide of iron which had taken place, and which was found interspersed between the intercrystalline spaces of the ultimate crystals of the metal in the manner previously described in this paper. There was, in fact, scarcely any metallic cohesion between great numbers of the crystals forming the physical structure of the shaft.

Careful micrometer measurements were taken of numerous of these internal micro-flaws, some of the results being recorded in table II. These sulphur flaws varied in size from .016 in. downwards.

In the case of this propeller shaft a careful approximate estimate was made of the number of these internal micro-sulphur flaws. The number in some areas was 34 micro-flaws within the limited area of only 0.00018 sq. in.; this would approximately represent an enormous total number of micro-flaws per cubic inch of steel.

Figs. 2 and 3 are careful micrographs, showing two typical areas of the sulphur flaws magnified 300 diameters, and these drawings are invaluable in affording visible evidence of the cause of the ultimate fracture of the propeller shaft.

These few remarks will have shown that a careful microscopical investigation with high microscopical powers on carefully and properly prepared sections, has revealed some of the visible, tangible and measureable germs of metallic disease influencing the enduring strength of metals.

[The St. Neots accident referred to is described in the editorial columns of this issue.—Ed.]

KALAMAZOO GASOLINE MOTOR INSPECTION CAR.

Manufacturers of railway appliances have not as a rule been active in placing new designs upon the market during the past two years, but there are exceptions in which a nunusual activity has been shown, and one of these is in the line of velocipede and inspection cars. The wooden velocipede which has been such a favorite for some years, still enjoys a large patronage, and will probably do so for a long time to come among some classes of railway men. All the recent designs brought out have been more expensive than the velocipede, and there is evidently a desire among the manufacturers to introduce these cars among railway employes of a grade further advanced than that at present accustomed to use them. There is little doubt that this can be done, and the fact that there is a demand for some class of car for getting over the lines more rapidly and with greater comfort than can be done with any type at present in the market, is evidenced by the fact that some of the officials on the large roads now have private locomotives for carrying them about. A few feeble efforts have been made for introducing steam handcars for this class of service, but they have resulted in little more than effort, for the probable reason that the designs have not been attractive.

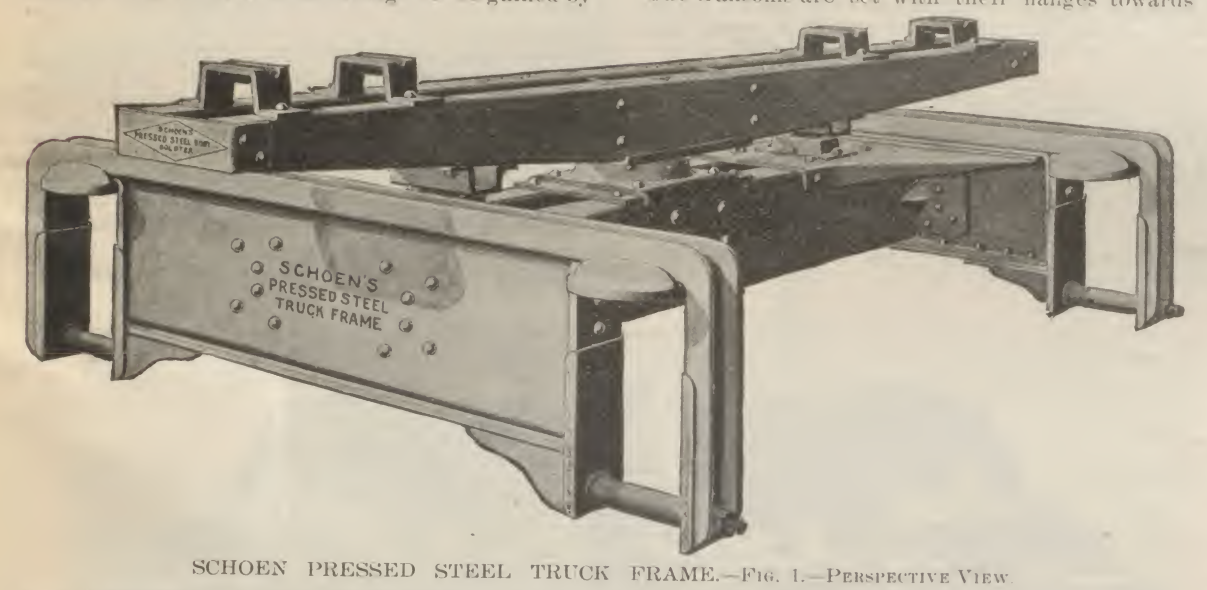
The Kalamazoo Railroad Velocipede & Car Co. of Kalamazoo, Mich., has been working on the problem of designing a car for meeting the requirements of this service, and of producing one which shall be both attractive in appearance and satisfactory in performance. The accompanying illustration shows one of the results. This car weighs about 3,000 lbs., will carry 12 or 15 passengers, and run at a speed of about 20 miles per hour on level track. The motive power is furnished by a double cylinder gasoline engine of 8 horse power, which consumes only one gallon of common stove gasoline per horse power per 10 hours. It is reversible to enable the car to be run in either direction equally well. All parts are very simple and the car does not require the attention of an experienced operator. The reversing of the engine is done by moving one lever only, and it is claimed that this is the only reversible gasoline motor in the market. It is stated that the car is entirely free from any possibility of fire, that there is no gasoline pump to cause trouble by leakage, and that the engine can

NEW KALAMAZOO GASOLINE MOTOR INSPECTION CAR.

be handled with perfect safety by a small boy. A suitable awning is placed on each car, which makes it a comfortable and exceedingly pleasant method of getting about in summer.

THE SCHOEN PRESSED STEEL CAR TRUCK

The part of car designs which is receiving the greatest amount of attention at the present time is the construction of the trucks and the demand for a satisfactory structure of this important member has brought out the arrangement herewith illustrated which is the design oft he Schoen Manufacturing Co., of Pittsburgh, Pa. It is considered by many car builders that there is an advantage to be gained by



SCHOEN PRESSED STEEL TRUCK FRAME.—Fig. 1.—Perspective View

placing the bearing springs directly over the journals where the initial blows are received when the cars are in motion. This was one of the governing factors in this design and the others were the first cost and cost of maintenance as compared with the old form of diamond truck.

The designer of the truck illustrated, has evidently kept these points constantly in mind, and has the advantage of a large experience in this particular line, to assist in perfecting this design. A good truck of this character should carry the load without appreciable deflection, providing that a good body bolster is used with it, in order to keep the load off the side bearings. It has been shown by past experience to be next to impossible to get a wooden bolster to do this, so the designer has added a valuable addition in the pressed steel body bolster, which is clearly shown in the accompanying illustrations, in connection with the truck frame.

Referring to the illustrations, it will be seen that the side frame is composed of a top chord or compression member in the form of an inverted channel. This gives great stiffness as compared with a flat member. The bottom chord or tension member of the structure is composed of a bar ⅝ x 4 in., extending along the bottom and vertically upward, forming the inside jaws of the pedestal. The space across the top between the upper and lower members of the side frame is filled in with a diaphragm which is flanged on all four sides. The flanges supplement the strength of the top and bottom chords, and the whole is riveted together by hydraulic power. A distance piece is placed in the jaw of the pedestal, under the journal box. A heavy bolt passes through it and through the bracket and the outer leg of the pedestal secured by two nuts and a split key, tying the jaws of the pedestal firmly, together in the jaw of the pedestal, as will be seen by reference more especially to the perspective illustration. Fig. 1, are chafing plates, which prevent wear on the part of the frame. These plates have a rectangular hole near the lower end, and are slipped over the tie bar. These chafing plates are light and should last a great many years, and if it were necessary at any time to replace them, it can be done for a few cents.

The transoms are set with their flanges towards each other, and vertical bracing is used to tie them together. A spacing plate is used under the center plate, which is varied in hight to suit conditions, at the same time this plate ties the two channels composing the transom, thereby stiffening them for resistance against transverse strains. Flanged gusset plates, extending from the inner jaw of each pedestal and well out on to the transom, keep the frame square. By placing the flanges of the channels, composing the transom towards each other, the body of metal composing the web of the channel is placed farthest from the neutral line, and thereby makes the transom stronger to resist transverse strains. This also gives a much greater clearance between the transoms and wheels for the brake beams and brake shoes than is obtained in trucks of this type, having the flanges of the transoms turned outward. The ends of the channel are blanked out, and in the process of forming the flanges the ends are formed at right angles to the body, giving a good and economical method of attaching the transom to the side frames. These transoms rest on the tension members of the side frames and are well riveted both to the gusset plates and side frames. In the two vertical braces in the center of the transoms an embossment is struck up, in the process of forming which gives a substantial support or guide for the lower end of the king-bolt.

There is an advantage claimed in making the side frame of a truck of this type, as shown here, over making it of one piece of metal. When made of one piece of metal the top and bottom flanges must of necessity be of the same thickness as the body or web. By this construction, however, the top and bottom chords can be made of any thickness and, as is the case in the top chord here shown, can be put into a shape to produce the best results, whereas, the web, which is the interposing strut between the two members, can be made of a different thickness.

Another advantage stated for this construction of side frame is in the formation of the pedestal. The illustration shows that the flat face of the compression and tension members form the guide for the journal box and the seat for the spring bearing, but if the side frame be made of one piece of steel it is claimed that this part of the truck frame could not be made so substantial and economical, and this part is subjected to very severe service, especially on curves. The practice of using mild wrought steel where there are heavy burdens and vibrations to be endured, has become universal in bridge work, and where heavy burdens are to be carried at high speed, as is the case on freight cars, it is predicted that it will be but a short time before this class of construction will entirely take the place of using wood and iron combined.

A few of the general advantages claimed for this design of truck are: Increased car mileage, the saving in dead weight, which will equal, probably, one car in a train: a large saving in flange wear on wheels, because the truck is kept square with the track and will not drag along the side of the rail after passing a curve. A saving in the wear of rails is also expected. It can be repaired in any shop, if injured by accident. It avoids delay of cars incident to repairs. It is of value after the car body is destroyed. It will avoid hot boxes because the frame will remain square.

The material used is a special grade of mild steel made from a specification which experience has proven to be the best for work of this character, where impact has to be resisted. With a truck frame designed to meet the requirements both of economy in first cost, maintenance and strength, together with special facilities of latest improvements for manufacturer, and located centrally for distribution at Pittsburgh, the largest steel producing center in the world. The Schoen Pressed Steel Company express confidence that they can show it to be to the interest of railroads to investigate and use this form of truck.

It should be noted that the illustrations do not exactly agree as to the tie bar at the bottom pedestal. This long bar has been omitted in design shown in the perspective view.

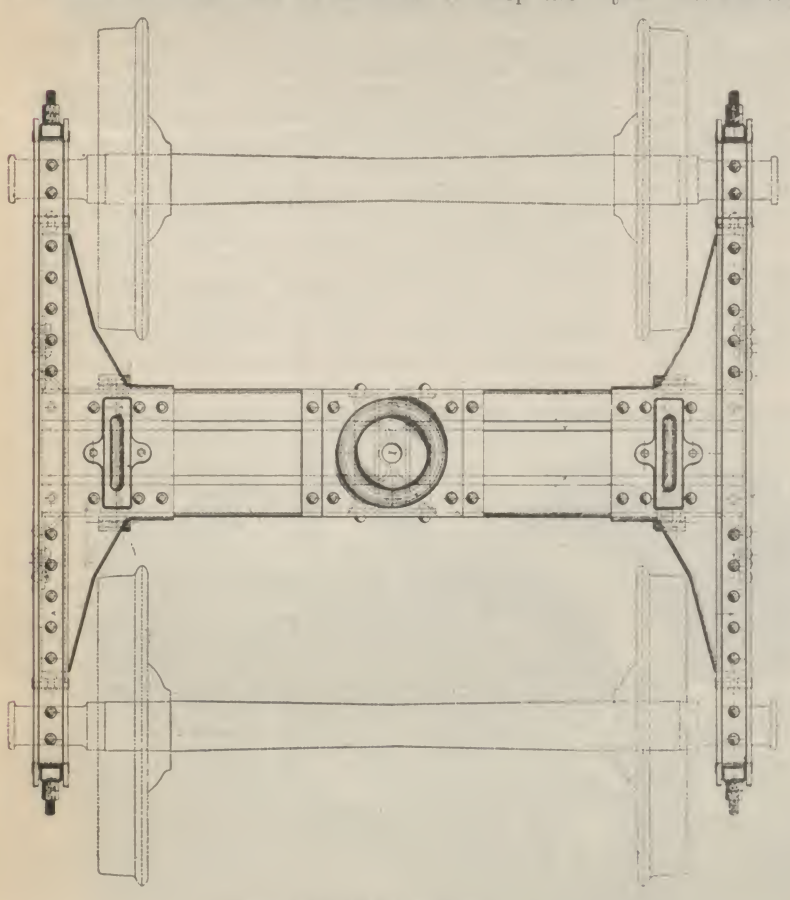


Fig. 2.—PLAN VIEW.

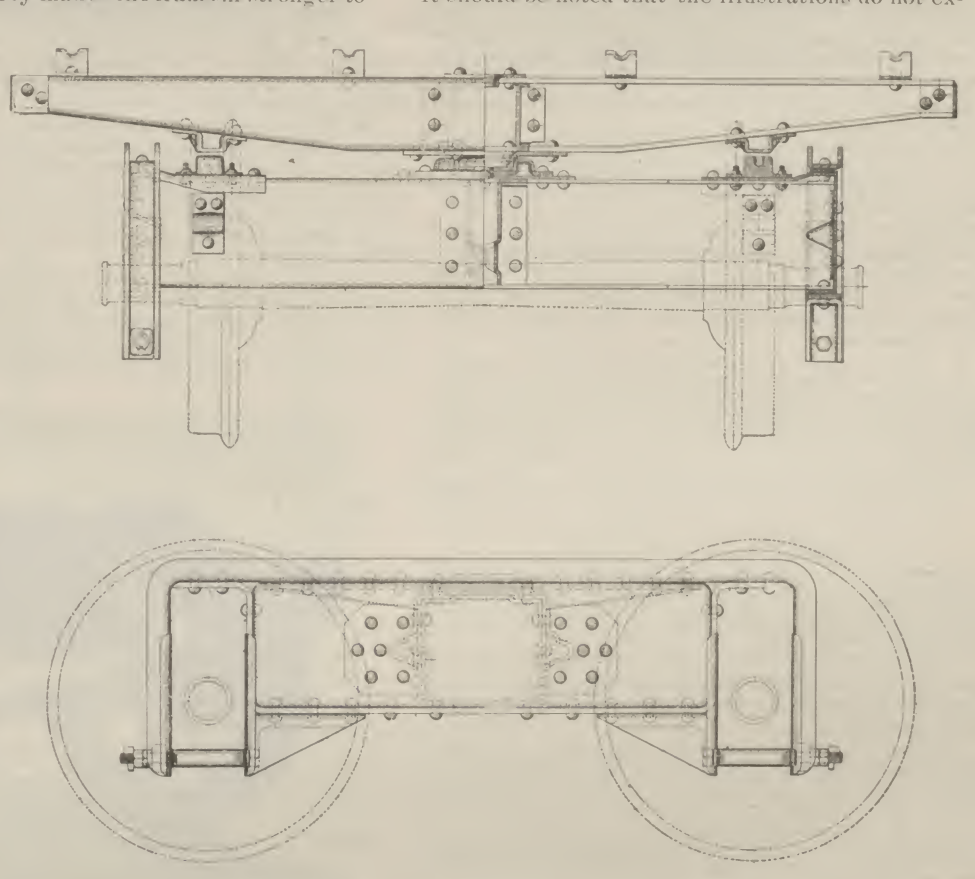


Fig. 3.—END AND SIDE ELEVATIONS.

LOCOMOTIVE GRATES FOR ANTHRACITE COAL.

The following exhaustive circular of inquiry has been sent out by the committee appointed by the Master Mechanics' Association to report on the question "What kind of grate is the most suitable for burning anthracite coal, cast iron, shaking or water bar?" This is for the purpose of obtaining information from the members of the association to aid in making up the report for the next convention.

1. Please state number of locomotives using anthracite on your road, in summer and also in winter.

2. What has been your experience with water tube

grates in: a. Fire-boxes between frames; b, fire-boxes on top of frames, and c, fire-boxes over drivers? Please state defects and advantages in each case.

3. What has been your experience with shaking grates in a, b and c, with defects and advantages?

4. What has been your experience with the combination of water tubes and shakers in a, b and c, with defects and advantages?

5. What has been your experience with the combination of water tubes and stationary cast iron filling pieces between, in a, b and c, with defects and advantages?

6. Which of the above four types of grates do you prefer with a, b and c, and for what main reasons?

WATER TUBES.

7. What has been your experience as to the improper and proper slope of water tubes? Have you any data as to its effect on circulation, steaming, self-freeing from mud, overheating, rising of tubes up out of fire, movement of ends? What is your preferred slope?

8. What is your preference as to methods of attachment of the two ends of water tubes? Please give your experience.

9. Have you had any trouble with water tubes rising up out of fire? If so, what was the slope and the exact methods of attachment of the two ends? Was the circulation obstructed by any foreign body not mud? To what did you attribute the trouble and how was it remedied?

10. What has been your experience as to the effect of bad waters on water tube grates? Please describe the waters. Are they scale or mud producing, or corrosive, as for example, mine water? Would be glad to have Kent's new Mechanical Engineer's Pocket Book, page 552, consulted when describing water.

11. Have you had any trouble with abrasion of water tubes?

12. What is your preference as to location and design of intermediate supports for water tubes?

13. Do you always use pull-out bars, and in what proportion to the number of water tubes? Do your pull-out bars enter front water leg and why?

SHAKERS.

14. With longitudinal or transverse cast iron shaking grates should the fingers of one grate mesh in between the fingers of adjacent grates?

15. Should locks be added to prevent the shakers turning except when desired? If so, what sort of locking arrangement is best?

16. With longitudinal or transverse cast iron shaking grates should drop plates be used? Where located? Should perforated or solid or any dead plates be used and where located?

17. With transverse cast iron shaking grates should the grates be connected together so as all to be shaken at once from the foot-plate; or divided into sectional areas, each area to be shaken as a unit independently from the rest? For what size of total grate area would you recommend each?

18. What is your preference in regard to method of supporting the side bearers of transverse grates of fire-boxes between drivers; by their attachment to fire-box sheet, under side of mud ring or side of ash pan? Same for fire-boxes over drivers?

19. Is any longitudinal slope required with shaking grates? If so, how much?

20. Should water tubes, shaking grates or the combinations be arranged so as to be level transversely? If not, what are the advantages of staggering or of sloping from the sides towards the middle?

21. What width of opening between fingers and what width of fingers of shaking grate or of stationary grate, or what space between water tubes, should be used with the different sizes of fuel? Do different sizes of fuel call for different types of grates other than merely these differences of opening?

22. Have you had any trouble with shakers warping and burning? With what quality and size of coal? What should be done in design or use to prevent these troubles? Can a cleaner and thinner fire and softer exhaust be used with water tubes entire than with shakers—area of grate being, of course, the same in both cases?

23. How many water tubes could be between two shakers and yet not give a line of dirty fire?

SHAKERS WITH WATER TUBES.

24. What is your experience in regard to the lodging of ashes and corrosion of sides of fire-box, due to shaker side bearers, or side water tubes, either with all water tubes or the combinations?

25. What provision in the design of different types of grates should be made to prevent the forming of holes in the bed of fuel next the fire-box sheets or the blowpipe action upon the sheets?

26. Have you ever used devices for stirring up the fire from beneath between the water tubes? Were they arranged to be raised up above the surface of the water tubes? Were they satisfactory?

27. What is your opinion in regard to the advantages of tight ash-pans in the consequent possibility of cleaning and shaking while running?

In heaviest express runs are your best engines free steaming after 50 miles? After 75 miles? Please describe the engine and grate or refer to blue prints.

BLUE PRINTS.

28. Please furnish blue prints of general arrangement and details of all types of cast iron or water tube grates ever in use on your road for anthracite. Please furnish print if possible, or at least a sketch with general dimensions, of all boilers with which each grate is used, giving size of cylinder, weight on and number of drivers, and number of engines of this type. If not shown on above prints please give pitch per foot of tubes and cast iron grates; and sketches of the intermediate support of tubes and cast iron grates, and the methods of attachment of the ends of tubes.

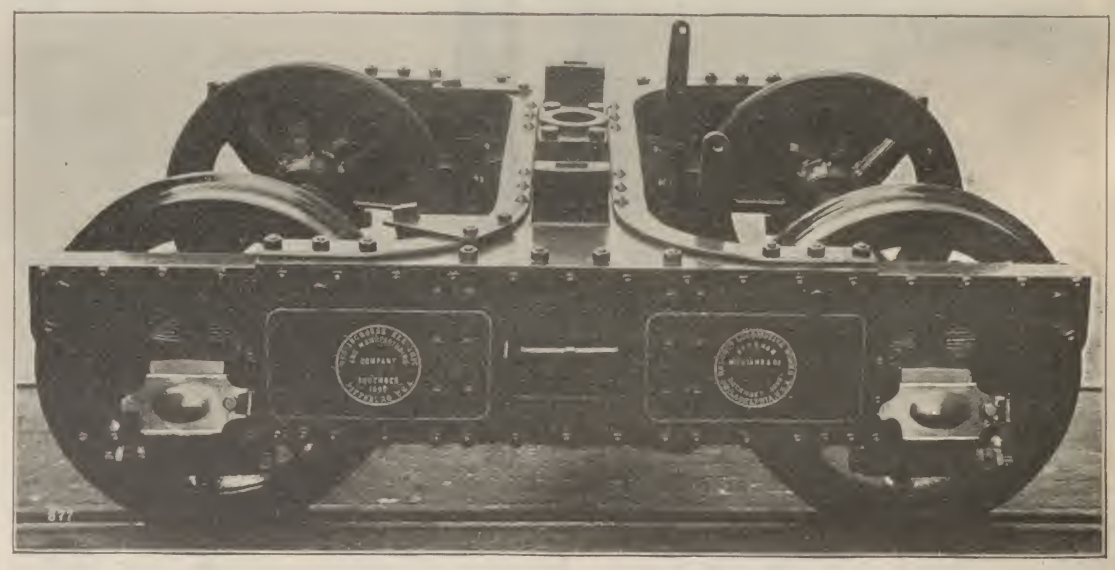
29. Which type of grate gives the best satisfaction for each above type of boiler, and for what grades and sizes of anthracite? What would be your judgment as to the reasons for this? Is the grate which is found best for the poor steaming engine the best, all things being considered, for the free steamer?

30. Anthracite locomotives may be classified for our purpose as follows: (Please give the number you have in each class in the blank space provided).

No. of anthracite locomotives with water tube grates only.....	Having fire-box between frames.....	1. Passenger.....
		2. Freight.....
		3. Yard.. .. ..
	Fire-box on top of frames	4. Passenger.....
		5. Freight.....
		6. Yard..... .....
	Fire - box over drivers.	7 Passenger.....
		8. Freight .....
		9. Yard.....
No. of anthracite locomotives with shaking grates only.....	Between.....	10. Passenger.....
		11. Freight.....
		12. Yard.....
	On top.....	13. Passenger.....
		14. Freight.....
		15. Yard,.....
	Over.....	16. Passenger.....
		17. Freight.....
		18. Yard.....
No. of anthracite locomotives with combination of water tubes and shaking grates.....	Between.....	19. Passenger.....
		20. Freight.....
		21. Yard.....
	On top.....	22. Passenger.....
		23. Freight.....
		24. Yard..... ....
	Over....	25. Passenger.....
		26. Freight..... ...
		27. Yard..... .....
No. of anthracite locomotives with combination of water tubes and stationary cast iron filling pieces between.....	Between.....	28 Passenger .....
		29. Freight.....
		30. Yard.....
	On top.....	31. Passenger.....
		32. Freight.....
		33. Yard.....
	Over.....	34. Passenger .....
		35. Freight.....
		36. Yard.....

COAL.

What sizes of anthracite do you use with each of the above numbered classes?



MOTOR TRUCK, LAKE STREET "L"—BALDWIN LOCOMOTIVE WORKS.

32. With the fire-box over drivers does a combustion chamber require or permit any difference in grate from a grate that would be used without a combustion chamber? Please explain fully.

33. What is your judgment as to the proper and the maximum number of pounds of lump and of fine anthracite burned per hour per square foot of grate surface for grates between drivers and grates over drivers? Please give any data you may have upon this point as to what has been done. What should be the depth of fire for the above sizes and grates?

34. Though not strictly within the intended scope of the committee's work, yet it would like to make some comparisons of the different requirements of grates for anthracite and bituminous, especially in cases where the same type of boiler has been used and for both at different times. Any data which you may have will be very acceptable to the committee.

What should be the ratio of anthracite and bituminous grate areas to total heating surface and to weight on drivers, or otherwise, as for example to fire-box heating surface and to cylinder volume?

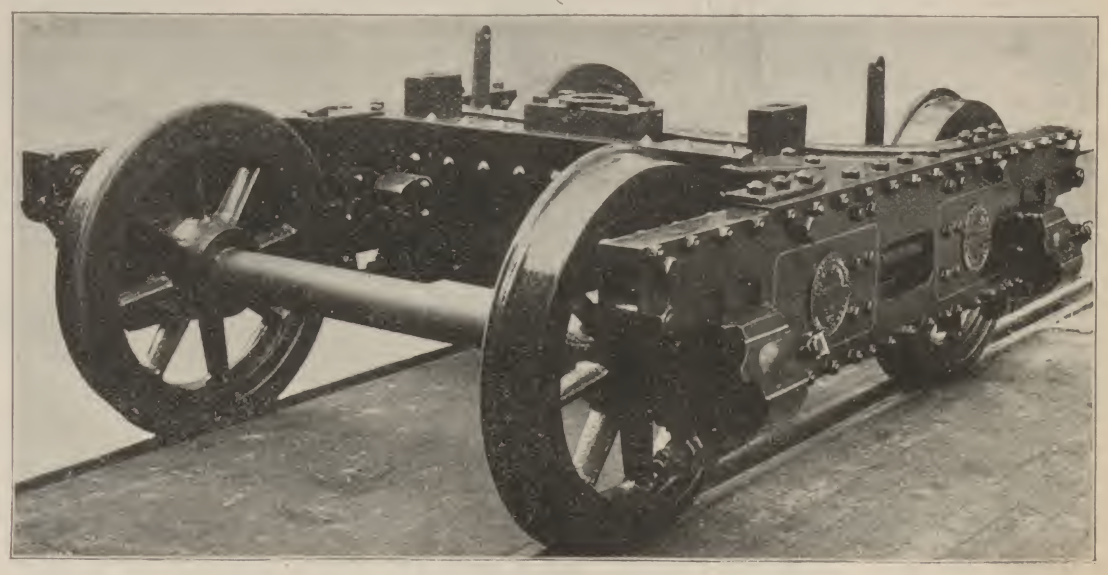
35. The committee would like anthracite and bituminous "performance sheets" for use of former and for comparison of the two.

So many railroad men are interested in the showing made by the Lake Shore & Michigan Southern Railroad in its record-breaking run from Chicago to Buffalo that the company has had a description of the run put into pamphlet form for general distribution. Copies may be obtained by writing to A. J. Smith, general passenger agent, Cleveland, Ohio, enclosing a 2-cent stamp for return postage.

MOTOR TRUCKS FOR LAKE STREET ELEVATED BY THE BALDWIN LOCOMOTIVE WORKS.

The designs of the motor trucks by the McGuire Manufacturing Company and the J. G. Brill Company for the electrical equipment of the Lake Street Elevated Railroad of Chicago were illustrated in the RAILWAY REVIEW of February 15 of the current volume, and the third design, by the Baldwin Locomotive Works, is illustrated by the accompanying engravings, of which Fig. 1 shows a side view and Fig. 2 an angle view of one of the trucks without the car. These trucks are veay heavy, weighing 10,000 lbs. each, and the construction throughout has been in accordance with the best locomotive practice of these builders. All the parts are fitted together in the best possible manner with planed joints and taper bolts. The wheel base is 6 ft.; the wheel diameters are 30, 33 or 36 in., according to the service. The axles have standard 4¼x8 in. journals, M. C. B. type, but are made straight between wheel seats to receive the bearings of the motors.

The trucks are provided with swing bolsters and double elliptic springs, in addition to which there are plate springs over the axle boxes. The arrangement of the brake rigging may be seen in the illustrations. There are no brake beams, and the brakes are operated independently on the two sides of the trucks. An interesting and valuable feature of the design is that whereby the motors, the brakes, the springs and even the swing bolsters, may be removed independently without disturbing other parts of the trucks. This idea has also been carried out with regard to the pedestal jaws, those at the ends of the trucks being provided with hinged joints, which permits of removing the wheels without taking the trucks out from under the motor cars. This item will be a great convenience upon elevated structures, where repairs may sometimes be required to be done outside of the shops. Also the wheels and axles may be removed without taking out the motors. The side



MOTOR, TRUCK LAKE STREET "L"—BALDWIN LOCOMOTIVE WORKS.

frames are formed of two heavy plates of steel bolted together by turned taper bolts, and separated by wrought iron filling pieces. This truck has many excellent features and embodies several ideas which have not been used before, and the results of the comparative trials of this design with those previously illustrated, should bring out some interesting facts.

These trucks were built to meet the requirements as published in the description referred to, and they are therefore designed to do the same work as will be required of the other designs. As was previously stated, there are fifty trucks built upon the McGuire design, two upon the Brill arrangement, and eight are built upon the designs which were made by the Baldwin Works. This latter design is practically

identical with those which are placed under the new Westinghouse-Baldwin electric locomotive, which is illustrated in this issue. They are so nearly alike that one description serves for both trucks.

THE NEW BALDWIN-WESTINGHOUSE ELECTRIC LOCOMOTIVE.

The fact was noted in these columns some time ago that an arrangement had been entered into by the the Westinghouse Electric & Manufacturing Company of Pittsburgh, Pa., and the Baldwin Locomotive Works of Philadelphia for building electric locomotives and similar equipment as trucks for motor cars. The first locomotive to be completed under this arrangement has just been sent out from the locomotive works to Pittsburgh, to receive its electrical attachments. This locomotive is a standard type for passenger service and has been designed for severe service, such as is now handled by heavy steam locomotives. In its construction, the principles of locomotive building, followed by these works have been embodied which should render it a satisfactory machine and not in any sense any experimental one.

We are indebted to Mr. David L. Barnes for information pertaining to the locomotive features of the construction. This locomotive has two, four-wheel trucks, which, except as to weight, are almost exactly like those illustrated elsewhere in this issue which are furnished by these works for the Lake Street Elevated Railroad of Chicago, were they are

NEW BALDWIN-WESTINGHOUSE ELECTRIC LOCOMOTIVE.

to be used in changing from steam to electric traction. Each one of the axles is equipped with a 200 horse power motor, and the four will be able to exert 1,000 horse power for a considerable period of time. The entire weight of the locomotive will be about 150,000 pounds, all of which will be available for traction. The under frame is of steel with heavy oak bumpers. The floor is covered with a half inch steel plate over its entire surface which is used to increase the stiffness and stability of the structure. The wheels are 42 in. in diameter, and the axles 6½ in. in diameter with 5 x 9 in. journals. The motors are known as the single reduction type and are steel clad. They have consequent poles and are rectangler in form. In this type of locomotive the gearing regulates the speed so that this design, in a general way, represents both the slow and the high speed locomotives.

The length of the locomotive is 38 ft. and the width 9 ft. over all. The operating machinery is all placed upon the trucks, and the interior of the cab contains nothing but the controlling apparatus, so that a large amount of space is available for such purposes as carrying freight or baggage. As to cost, a very material reduction will be made in this design over that of the Baltimore tunnel locomotives which cost $50,000 each. The Baldwin-Westinghouse machine will cost less than $20,000, and it is designed to perform about the same work. The Baldwin-Westinghouse locomotives are geared so as to give a speed of seventy-five miles per hour, but it is stated that a very much higher speed may be attained if desired. This is one of a number of designs by this combination and it is expected that locomotives for many different kinds of service will be constructed. These include, mine, tunnel and rack locomotives, and also for suburban and elevated work. A second locomotive is nearly completed at the Baldwin Works which is to be applied as a motor car upon the Manhattan Elevated Railway of New York. All of the Baldwin-Westinghouse locomotives are to be equipped with air brakes for which the air will be furnished by a pump placed underneath the cab and operated by an independent electric motor. They are also designed so as to make use of any method of electric traction such as the trolley, third rail, or the Westinghouse electro-magnetic system. They can also be operated in connection with the Tesla polyphase system. It will be noticed in this illustration that there has been no attempt to follow or copy existing designs of steam locomotives in any way, the arrangement of this chine being entirely new, and the work has been done with a view of making an arrangement the most convenient, and best adapted to the requirements of electric traction.

Tests of Washington Fir and Eastern Oak.

Receiver Burleigh, of the Northern Pacific, and General Manager Dickinson recently ordered expert O. D. Colvin to institute tests of Washington fir in comparison with eastern oak, with particular referance to its value as a car building material. The report as submitted by Mr. Colvin is as follows:

South Tacoma, Wash., Jan. 24, 1896.

The following breaking tests were made by O. D. Colvin at the South Tacoma car shops of the Northern Pacific Railroad Company between eastern white oak and Washington fir: A dressed piece, two inches square, was given an 18 in. span and lift made by an hydraulic jack, with the following results:

First—Ten pieces were selected, which had not been seasoned, of both oak and fir; a lift was made until piece broke. The result was as follows:

Fir, green.	Oak, green.
2950	3250
3100	2100
3050	2600
3000	3000
2750	3000
2825	2800
2325	3600
2800	2200
2450	3000
3200	1800
Average, 2845	Average, 2735

110 pounds in favor of fir.

Second—Ten pieces were selected of both oak and fir, well seasoned, and no attention given whatever to the bearing in regard to the grain; the lift was made until piece broke. The result was as follows:

Fir, seasoned.		Oak, seasoned.	
Deflection.	Strain.	Deflection.	Strain.
5-16 in.	3500	½ in.	4250
5-16 in.	3400	½ in.	3300
7-16 in.	4000	3/8 in.	2300
3-16 in.	3700	5/8 in.	3900
½ in.	5000	7-16 in.	2300
7-16 in.	3900	11-16 in.	3100
7-16 in.	4100	5/8 in.	3100
½ in.	4700	11-16 in.	4200
5-16 in.	3200	3/4 in.	3000
5-16 in.	3500	11-16 in.	2700
60-16 in.	39000	94-16 in.	32150
6-16 in. average	3900	9.4-16 in. average	3215

685 pounds per stick in favor of fir.

Third—Six pieces of fir were selected, which had been under cover one year, with the following results:

Deflection.	Strain.
9-16 in.	4300
3/8 in.	3900
7-16 in.	4400
7-16 in.	4100
½ in.	4400
½ in.	4300
4233 pounds average.	25400

The conditions were the same in each test and care was taken to select the best quality of both oak and fir. The following certificate accompanies the report:

This is to certify that I was present when the comparative tests were made between oak and fir at the South Tacoma shops, January 24, 1896, and I know of my own personal knowledge that they are correct, as shown by the attached statement.

H. W. Topping,
of Parker & Topping.
G. H. Gilman,
General Car Foreman, N. P. Shops.
J. T. Howson.
Mgr. Am. Foundry Co., So. Tacoma.

Association of American Railway Accounting Officers.

The eighth annual meeting of the above association will be held at New York City, commencing Wednesday, May 27, 1896, at 10 o'clock a. m. It is hoped that every member will make it a point to be present if possible.

The following is the order of business: 1 Calling roll of members; 2. Reading minutes of last meeting; 3. Enrollment of new members; 4. Report of executive committee; 5. Reports of standing committees; 6. Reports of special committees; 7. Unfinished business; 8. Consideration of report of executive committee; 9. Consideration of reports of standing committees; 10. Consideration of reports of special committees; 11. Reading of addresses; 12. Election of officers and executive committee; 13. New business; 14. Fixing time and location of next meeting.

A New Departure in the Line of Railroad Advertising.

That railroads are extensive advertisers will not be disputed, but it is not often that such an extensive as well as costly scheme is projected as the one now employed by the Lehigh Valley Railroad. There has recently been on exhibition at Buffalo, N. Y., a series of pictures showing the picturesque region through which the Lehigh Valley runs, which are well worth inspection from an artistic and a student's standpoint. This railroad is contiguous to the Central New York lake region, and here we have magnificent views of gorgeous scenery bordering the lakes of Shawanese, Seneca, Cayuga, Owasco, Ganoga Hemlock, Winola and others of the prettiest sheets of water the Empire state affords.

This line appears to run on the most picturesque spots touching, as resting places, on those very dainty bits of scenery where the tired eye and the weary heart loves to linger. The scenery is weird, sublime, grand and beautiful, such as poets and artists picture. Such, too, in which the business man will forget his cares and his business, and will lovingly dwell in peace and contentment with the everlasting hills around him. Here and there, surrounded with nature's beauteous and bountiful and majestic grandeur, one sees a little thriving town lying low in the valley, reminding one that "men struggle e'en when hidden," limping along, as it were, in a great race, but contented that they are left in peace to work out their own ambitions.

The views along the Susquehanna, at Niagara Falls and at Mauch Chunk are sublime. They remind one of Swiss scenery on a gorgeous scale. Among the best pictures presented are an admirable view of Lake Ganoga and the summit of the Alleghenies, another across Hemlock Lake, where Rochester City receives its water supply, Mauch Chunk from Flagstaff, town of Towanda, in Northern Pennsylvania, buried in the hills, several views of Niagara Falls, Mauch Chunk and other scenery extending from Perth Amboy to the city of Buffalo.

The most marvelous picture is one of Niagara Falls, numbered 694 on the catalog, which is more like a painting than a photograph, inasmuch as it shows the peculiar tints of the falling water over a rock caught in the fastest time on record. Besides these are views of the Perth Amboy coal mines and wharves, South Plainfield coal storage, showing the trucks with a capacity of 100,000 tons, Musconetcong tunnel, curve and glen, Morris canal, Lehigh Valley from Piccadilly Hill, a magnificent view of the Blue Mountains across country from Paxinosa Inn, Easton and other panorama showing the Wyoming Valley from Wilkes Barre Mountains, and a beautiful view in calm sunlight of Seneca Lake and Watkins.

It is not necessary, however, to single out more of these beautiful pictures for special notice, for every one of the more than two hundred is worthy of careful scrutiny.

Testing Machines at the Armour Institute, Chicago.

In a recent communication from Prof. Frank C. Hatch, director of the department of mechanical engineering of the Armour Institute, the following is said about the equipment of mechanical testing apparatus recently installed in the mechanical laboratory of that school.

"We have a 200,000 pound Riehle testing machine, equipped for automatic and autographic work, a 60,000 pound Olsen machine, and a 20,000 pound Riehle machine, all arranged for tests in compression, tension, and transverse stress and strain. The two former are operated by power furnished by electric motors, and the tests we have made on them have been in every way satisfactory. One of these, and the first in the course, was a series of tests made to determine the tensile strength of a great many wire cable stands sent by the contractors on the Chicago Drainage Canal. Another recent test has been that to determine the holding qualities of the grips used in the guy ropes of the construction department of the Chicago Telephone Company, and we are now completing a series of tests for a manufacturer of wrenches to determine the tensile and torsional strength of quite a number of wrenches now on the market. For other laboratory equipment, there is now being added a large Emerson power scale, which will probably, soon be in condition for use. These, with a 2,000 pound Riehle cement tester, and a Thurston torsional machine, cover the principal equipment of the laboratory. The general equipment has been increased from time to time, until there is little wanting in instruments for fine measurements, in any of the fields of mechanical engineering work. Perhaps one of the most unique pieces of all the apparatus is a scale,—the first ever manufactured by the Fairbanks, Morse Company, and donated to the schools, weighing to the thousandth of a pound, to be used in cement testing. The general equipment covering indicators, calorimeters, pyrometers, tachometers, etc., is as complete as could possibly be wished."

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CHICAGO, SATURDAY, MAR. 7, 1896.

IT will be remembered that when the University of Chicago was first started the president of that institution in outlining its plans stated that a technological school was among those to be established in the near future. Referring to this statement a contemporary suggests that in view of the time that has since elapsed and the fact that no progress has been made, an explanation from Dr. Harper is in order. The RAILWAY REVIEW is not the mouthpiece of the University of Chicago nor is it authorized to publish any of the plans of that institution regarding the study of technology, but it can say with definiteness that the matter has by no means been lost sight of, and that those interested in this particular branch of study may expect to be treated to an agreeable surprise in the not very distant future. Dr. Harper has a way of doing such things and there are no present indications of his adopting new methods.

THE placing of several large orders for wrought iron pipe, skelp, sheet and plate iron last week, accompanied with inquires for considerable material for general construction requirements, aroused the hope that the deadlock in the iron trade was broken. There is at present a vast amount of material under inquiry from railway managers down to shop managers. This is the secret of the strong market. Coke and ore hold their own. Pig iron production is still declining, but the limit of restriction has been nearly reached. To say when all the enormous projected requirements will be filled would be mere guess work. Outside conditions will determine. The general markets are not favorable yet. Railway managers, had they their way, would order freely of track material. Machinery makers and engine builders are on the point of making extensive purchases. All indications point to an enlarging demand among small consumers, which in the aggregate will be satisfactory.

THE Baltimore & Ohio receivership furnishes another to the many previous illustrations of the futility of attempting to operate a railroad upon other than business principles and incidentally of the comparative independence of the investment and business interests of such property: or in other words, the difference between railroads and railroading. To those railroad men who have watched the course of the Baltimore & Ohio Railroad, the present outcome is merely the inevitable. The investments of the past few years have been based upon ambition rather than probable earnings and as a result dividends and fixed charges were both wanting: and those who have been led to put their money into the property will receive little but experience in return. The Baltimore & Ohio Railroad Company may go out of existence but the Baltimore & Ohio Railroad will continue to run and to serve the communities dependent upon it. It is altogether possible that some business which costs more than it comes to may be dropped, but the work for which the railroad was or should have been primarily constructed will continue as heretofore.

OWING to the varied methods of keeping accounts and to the difference of units of comparison employed, it is difficult to get a clear understanding of the relative charges of transportation of foreign roads and those in this country. There is a general notion prevailing that transportation charges in the United States are the lowest of those of any nation. Those who do not agree with this proposition are fond of quoting Australia as disproving the assertion. It is interesting, therefore, to know of the opinion of the Hon. H. R. Mackay, commissioner of Victorian railways, who lately visited the United States, upon this subject. Writing to a railway official in this country, he says:

After full inquiry I arrived at the conclusion that in both freight and fares and in railroad accommodations generally the Americans are about the most favored people in the world. If one considers the sparse settlement in the west, the excessive competition, and the peculiar policy adopted by many legislatures toward the railroads, one cannot but admire the genius for practical management and the fertility of resource under great difficulties which is displayed in the working of the lines. I only wish that our Australian government roads approached the American standard in equipment and in business-like care for the convenience of shippers and travelers.

It may also be of interest to know that the gentlemen in question, speaking from experience and in a sense apologizing for his own country, says that in the very nature of things government management of railways is weak and vacillating when compared with private management,—not a very encouraging endorsement of government operation from one who is directly charged with the conduct of such properties.

THOSE who are responsible for work which requires the attendance of men day and night are confronted by the problem of securing satisfactory men for the night shifts. This is particularly true with regard to the service of interlocking plants and similar cases where considerable responsibility is placed upon the men and where they are alone much of the time. A man becomes a machine and looses interest in many things if he works always at night and is obliged to secure his rest and sleep in the day time. It is frequently the custom to allow the day and night shifts to change month by month, and while this overcomes a great deal of the difficulty an attendant evil is introduced by the necessity of making one of the shifts of eighteen hours or so duration at the time of the change in the case of two men working together. Similar difficulty is found with night watchmen, and the case is very well put from the standpoint of fire insurance companies by Mr. C. F. Simonson, general inspector of the Hartford Fire Insurance Company, in an address to the officers of that company, which was published in a recent issue of *Engineering News*. In this article the following statement is made: "A man that works at night and sleeps days becomes a machine instead of a live man, and it is a common thing to find buildings badly on fire with the watchman taken out suffocated and nearly dead." The criticism of the present system is accompanied by a very sensible suggestion which applies equally well to signal men and other railway employes as to watchmen. The recommendation made is that two men should be selected who are capable and fit for the work of watching, and in the cases of factories they should be capable also as helpers about the works. One begins his shop work at noon and when the shop closes at night he takes his supper and enters the routine of watching, which he continues until eleven thirty, and reaches home before midnight: the second man then comes on duty and watches until six o'clock in the morning, when he opens the factory, starts up the fire sand prepares for the work of the day. He leaves his work at noon and returns to it again at eleven thirty. This idea is excellent and is worthy of study and of application in a number of lines of work. It may be said that good discipline should be relied upon to secure satisfactory service of men who are employed at night only, but discipline cannot be expected to reconstruct human nature. It is therefore well to consider the advisability of arranging to divide the night work between men so that the burden will not fall upon one man. This can be done without extra expense, as Mr. Simonson has shown, and there would seem to be no valid objection to be raised to the plan. Its best recommendation is that it reaches and removes the cause of the difficulty in night work.

A PECULIAR RAIL FAILURE.

A very remarkable accident occurred at St. Neots on the Great Northern Railway of England November 10th of last year. This is one of the few cases on record in which a train running at a speed of sixty miles per hour, met with an accident by derailment. The consequences to the train as well as the cause to which the accident was attributed, are both of special interest, and the wreck was such an unusual one that a record of it furnishes considerable material for study. It has recently been said that owing to the absence of practical examples, it has been impossible to predict as to what the result of the derailment of a train running at sixty miles per hour would be. In this case the last four cars of a nine car train became derailed through the breakage of a rail and collided with some loaded coal cars which were standing on an adjoining track. The sixth vehicle from the engine was almost wholly destroyed and the rest of the cars very badly damaged. The greatest wonder was that only two people were killed and but seventeen injured. It is not known positively that the engineman applied the brakes immediately after the derailment occurred, but the brakes were thought to have been applied automatically by the separation of the cars. The total distance run by the engine and the front portion of the train after the derailment occurred, was two thousand three hundred and thirty-one feet and the distance at which the engine stopped from the point at which the automatic brakes were applied, was one thousand five hundred and fifty-seven feet. These distances furnish a reason for wonder that the wreck was not much more serious. The Board of Trade inspector comments upon these distances and remarks in his report that they are not excessive in view of the fact that a considerable portion of the brake equipment of the forward vehicles of the train was so damaged as to be ineffective.

The greatest interest in this accident, however, centers in the broken rail, the character of the rail itself as determined after the accident, and its manner of breaking. The report says, "There was no trace whatever of any wheel having been off the rails or of anything which could have caused any wheel to leave the rails south of a point at which there were found two adjoining rails on the same side of the track, one of which was broken into seventeen pieces, none of them being over twenty-two inches in length. The adjoining rail was broken into four pieces. A train of empties had just preceeded the express and nothing was found wrong about the track at that time. The locomotive of the wrecked train had a leading four wheel truck, one pair of driving wheels and a pair of trailers. The weight on the drivers was forty-two thousand nine hundred and sixty pounds. The engine is supposed to have made the first fracture and possibly more. The tender and the two leading cars got safely by and it is thought that the rear wheels of the third car, which was a Pullman, were the first to leave the rails, though this car was found standing upon the rails again after the accident.

The history of the broken rails is a little cloudy. It is stated that these rails were rolled in 1872 by a concern which has since gone out of business, and no records of the chemical and physical properties at the time of its manufacture are available. After having been used for thirteen years these rails were taken out and laid aside for future use in making repairs. The two which were found broken, along with some others, were relaid in 1886. At some time since then they were placed in positions in which they caused the wreck. The weight of the rails was originally eighty pounds per yard, and one of them was worn down five-sixteenths of an inch in hight and weighed seventy pounds per yard; the other one was found to weigh seventy-two and three-tenths pounds per yard, and they were both found to be worn an eighth of an inch at the chair seats. These rails are of the bull-head pattern, which has been almost universally adopted by the railways of the United Kingdom.

As a consequence of this disaster the Great Northern Railway Company is "strongly urged" by the Board of Trade to increase the weight of standard rail for main lines from eighty to at least ninety pounds per yard and to replace by new rails all of those of the old eighty-pound section which are found to be worn. An elaborate series of tests was made at the instance of the Board of Trade in the effort to ascertain the cause of the strange fractures. The first fracture was thought to have occurred at minute induced flaws which did not exist at the time the rails were manufactured and which could not have been detected before breakage occurred. A microscopical examination showed a number of such minute flaws which had commenced at the top of the rail and were gradually extending downwards into the rail, and it was considered by Mr. Andrews that probably the first fracture occurred over one of the chairs where the rail showed unmistakable signs of having been broken from the surface downwards. The breakage was thought to have been due to the weakening of the rail by the reduction in the section and also to the little flaws. Some other tests by Mr. Andrews in this line of investigation appear elsewhere in this issue. The extraordinary number of fractures seems to be clear evidence of the brittleness of the structure of the rails.

The chemical analysis showed that there was too much sulphur and phosphorus to meet present requirements but not enough to cause them to be considered inferior rails.

The tensile tests gave an elastic limit of twenty tons per square inch for the top, and nearly twenty-three tons for the bottom, and the ultimate stress varied from twenty-six tons to nearly forty-five tons for the top, and forty-two tons for the bottom. The record of the elongation, however, tells the story, for it was found to be as little as one and two-tenths per cent at the top and twenty per cent at the bottom of the same rail. The steel was considered by the expert examiners, to have been a good quality originally. The results from the test pieces taken from the bottoms of the rails where the steel would naturally be the least effected by service, compared very favorably with the results recently found by the Messrs. Kirkaldy of a great number of new rails. Of the tests made upon the broken rails by this firm, the report says: "The difference between the behavior of the pieces taken from the top and the bottom respectively, is somewhat remarkable, and there is also a distinct difference in the texture, or granular appearance of the fracture, showing the steel to have been hardened adjacent to the rail surface, and to have gradually altered in character toward the web."

It is to be hoped that the reports of the experts who examined these rails may be published at length, as they will undoubtedly throw valuable light upon the subject of the alteration and character of steel rails due to constant hard service. Doubtless this will furnish a text for many an argument by those who still choose to believe in the crystalization theory, but there seems to be excellent reason for considering this accident the result of a neglect to remove rails from the track in which they had been undergoing a cold rolling process for too great a number of years. This is also clearly an argument against the increase of driving wheel pressures without increasing the weight of rails, and while no mention is made in the report of the possibility of the counterbalancing having had any part in the fractures, it would be interesting to have some expert testimony on this phase of the matter. One result of the disaster will be to cause a more careful use of worn rails, and it seems advisable to uggest the desirabilit, of knowing with some sort of certainty the history of steel which is placed in the main track. If it is removed and laid aside after a constant service of thirteen years, not being worn out, it would seem advisable to relay it in secondary instead of main high speed lines. In this country steel is usually badly worn after such a service that it can only be used again on side or branch tracks, and there is not the same degree of temptation to continue its use too long, yet it would be well to learn a lesson from this case as to what may result from such a course.

REFRIGERATOR CAR DRIPPINGS.

The Central Railway Club has started a commendable work in instituting an inquiry with regard to the injury caused to bridges, track, trucks, etc., by the dripping of salt water from refrigerator cars. A committee having the subject in charge recently sent out circulars consisting of four questions which were designed to bring out the experience of each of the important roads handling these cars in regard to whether this difficulty had been found to be serious, and asking for information pertaining to proposed remedies therefor. Fourteen diffierent railways, and and also several refrigerator companies replied, and the information obtained is valuable. It is safe to say that comparatively few have realized that such a small matter as the dripping of salt water from passing freight trains could have any important effect upon the safety of structures, but the reports of several of the large roads indicate that this difficulty has been underestimated, by those who have considered it trivial. It is interesting to note that the troubles experienced are almost wholly confined to the tracks upon which the loaded cars are hauled, and the effect is most noticeable on curves and at points where the trains stop and start, as under such circumstances the brine which may have collected in the pipes during a run, is thrown violently to the outlets from which it escapes in larger quanties than when running quietly.

The most dangerous features of the corrorsive action are in connection with the rapid deterioration of certain members of bridges. The parts suffering most have been found to be the floor beams, the stringers, and lateral stay braces. Trouble also has been experienced in the rapid corrosion of angle bars and bolts. One case is reported on the Lehigh Valley Railroad in which a broken rail was caused by this action. The rails on this road are reported to have rusted so rapidly in places and also the angle bars as to make it impossible to tighten the latter properly against the rail even with the new bolts. Another road which operates several transfer boats for ferrying cars across a river, has found very rapid destruction of the iron decks, and this was so troublesome as to necessitate frequent washing of the decks and the use of special chairs which would exclude brine from crevices. Remedies have been applied in the form of frequent painting, and in one case the portions of the bridges subject to the contact with brine have been protected by coating them to a thickness of a half inch with a mixture of paint skins and sand. The remedy of painting will apply to bridges, cattle guards, pipe lines for interlocking apparatus and such parts, but there is no remedy to apply to track bolts, angles, and switches except to begin at the root of matters and prevent the dropping of the brine.

The replies received from refrigerator car companies indicate that the matter has attracted the attention of officers who are responsible for this equipment. The effect of the drippings upon the iron work of the trucks of these cars is reported to be very bad, and the suggestions for a remedy from one of the companies is that a drip pipe or trap should be placed at the center of each end of the cars, discharging the drippings between the brake beam and the axle, and upon the middle of the track. This would to a large extent solve the difficulty as regards the track itself, but it would not prevent the damaging of bridges. The recommendation of the committee was made with a view of stopping all the trouble by attacking the cause, viz: the dripping, and by equipping the cars with reservoirs or collectors located near the center of each car, they would have the drippings all discharged at one time at the regular stopping points of the trains, where the work could be attended to by trainmen or inspectors, and these reservoirs would be provided with drip pipes, which, in the event of their overflowing, would discharge the brine in the center of the track and away from the brake beams and axles.

The suggestion of the committee is an excellent one, and there would seem to be no reason why the owners of these cars should not be required to maintain them in such condition as to prevent dangerous damage to track structures and equipment. This direction seems to be the best in which to work, for the reason that protection by paint and inspection is expensive and not a sure cure for all of the troubles which must be increased with the wider introduction of solid floor bridges. It would seem to be no hardship to require the car owners to build small tanks, as is suggested, and this is a matter which may be very easily covered by the interchange rules, under the principle which requires cars to be in a condition safe to be run over the road. Safety to the road is important equally with safety of the cars. It is thought that by calling the attention of the officers of the refrigerator lines to the fact that dangerous consequences may follow neglect of this matter, that the compartively small expense involved would be cheerfully borne by them.

COMPELLING TESTIMONY.

If the reported finding of the United States supreme court in the case of United States vs. Brown, shall be confirmed by the published decision of the court, a new era in the enforcement of the act to regulate commerce will have been begun. Heretofore it has been practically impossible to obtain evidence concerning violations of the law. The parties connected with such infractions are usually the only ones having a knowledge of the facts in the case, and they naturally are opposed to the furnishing of evidence that would tend to convict them or their associates. The law also was weak in that it sought to punish those who were technically guilty rather than those who profited by the transaction, and the result was that no one connected with a railroad could be found who was wiliing to go on the stand and testify againt a fellow railway employe. Because of this fact the very sorry spectacle was presented of men in high position who could not by any stretch of construction be held to be implicated in and in many cases having no knowledge of a transaction, going on the stand and, under oath, refusing to testify, on the ground that their testimony might tend to incriminate themselves. As an illustration of the extreme to which this excuse was carried, may be mentioned that of the treasurer of a certain road in a case where certain sums of money were alleged to have been illegally paid to shippers. After testifying that, until he was summoned in the case in question, he had no knowledge whatever of any such payments, had never heard of them, and if paid must have been paid by his subordinates in the regular course of business, when asked to produce the voucher refused on the ground that it might tend to incriminate him. Such a claim may be perfectly correct from a legal standpoint, but viewed in the light of common sense either the testimony or the claim was false.

It is fortunate that at this time also, the sentiment of railroad men regarding the violations of the law are undergoing a change. When first enacted the law was by them generally regarded as a sort of imposition; to be complied with when necessary, but evaded when possible. Gradually, however, the fact has dawned upon them that properly construed and faithfully observed, the law tended to conserve railway revenues, and, if maintained, would, in the absence of other possible remedies, operate to some extent to minimize freight wars, and thus protect earnings. It is probably still true that minor officals would hesitate to prefer charges against a brother official, but the managers of some of the larger properties have come to realize that revenues are more important than any sentimental regard for those who are bent on injuring their property; and they are now ready to take such cases to the courts. If the pending amendment to the law which proposes to abolish the imprisonment clause for violation, and make the corporation as well as the individual responsible by way of fine, shall become effective, this practice which is now being only considered, will be universally adopted.

Perhaps the most absurd thing in connection with this whole matter is the objections that are urged against the decision of the supreme court which sustains the law requiring witnesses to testify in such cases. It is said that the loss of self respect because of being obliged to confess to the committing of illegal acts would be a severer punishment than the mere fact of a fine or imprisonment. In the first place it will be rare that the parties immediately engaged in an illegal transaction will be called upon to testify; for the reason that if others can be compelled to give evidence, their testimony will not be required; and second, a self-respect that is dependent upon the opinion of the community for its maintenance is not worth having. Self-respect is altogether a different thing from reputatiou. Many a man has a better, and some men worse reputations than they deserve, but the man whose only claim for self-respect is the reputation he possesses in the community, is not worth consideration on this account. From any aspect of the case, therefore, the reported decision of the court is most fortunate, and if it shall be found to be borne out by the proceedings of that tribunal, will prove to be of vast advantage to the railways of this country.

Central Railway Club.

The next meeting of this club will be held at the Hotel Iroquois, on Friday, March 13, 1896, at 2 p. m. Reports on "Air Brake Testing and Inspecting Plants." Committee: H. C. McCarty, Pennsylvania Co.; J. R. Petrie, Buffalo; J. A. Chubb, Michigan Central; F. H. Ball, Lake Shore & Michigan Southern, and "Tool Rooms in Machine Shops and Best Methods of Handling Them." Committee: S. Higgins, F. B. Griffith and John Mackenzie. The following reports will be submitted for discussion: Report of committee on "What is the proper method of stenciling the light weight on freight equipment cars, with a view of having the stenciled weight agree with the actual weight after the lumber in the cars has dried out?" Report of committee on "Safe Ending of Boiler Flues." Report of committee on "Injury Caused by the Drippings of Salt Water from Refrigerator Cars to Track, Bolts, Trucks, etc." Topical questions submitted by members.

TRANSMISSION OF POWER FROM THE DRAINAGE CANAL TO CHICAGO.

In his remark at the banquet of the Western Railway Club in September of last year Mr. L. B. Stillwell said that it is entirely within the limits of possibilities of electric traction as now developed, to operate trains within the city limits of Chicago by power transmitted from the drainage canal near Joliet. In this connection Mr. H. S. Putman's paper before the American Institute of Architects recently published in the Electrical Engineer will be of interest. The following gives the substance of the paper.

The drainage canal when completed according to the present plans and contracts, will stop at Lockport and will have a flow of 300,000 cu. ft. of water per minute. After deducting say six feet for the slope on the surface of the canal, there will be available at Lockport about a 12 foot head of water. With a turbine of 85 per cent efficiency, this will give us 5,800 available horse power. Upon the completion of the canal, however, with the flow at the full capacity—600,000 cu. ft. per minute, a water power will be developed of immense value to that community, and also to this city. Lake Joliet just below the city of Joliet, is 76 ft. below the low water mark of lake Michgan. Allowing six feet as before for the slope in the surface of the canal, we will be able to utilize the remaining

head of 70 ft. in two steps. one at Lockport, and the other at Joliet, of nearly equal amounts. As the tail races of the power used at Lockport can be turned back into the canal, no water will be lost, but it can all be utilize for the entire fall. Taking the efficiency of the turbine wheels as before at 85 per cent and allowing a loss of one foot of the head in the rise of the water in the tail races and other obstructions to its flow, at each step, we have available 65,700 actual horse power, in two steps of nearly equal amount at Lockport and Joliet. The flumes for the utilization of this water power can be put into the canal when it is being built, at practically no additional expense, and the tail races can be built at a merely nominal figure as compared with the great amount of power to be developed. Thus in this case we avoid the common objection to water power, namely, the immense cost of the necessary dams, etc, so as to make the water power available, compared with the amount of power used. The interest on the necessary money outlay, often exceeds the cost of coal where steam is used.

After the ship canal is built, provision being made for water power flumes, it is more than probable that all necessary tail and head races can be constructed for less than $50,000. Then again we have an available market for the whole of this immense power. It is probable that Joliet and Lockport can use only a small portion, but Chicago, with its population of two million, and a daily consumption of between two and three hundred thousand horse power, offers a grand market. That this power can be transmitted to Chicago economically and profitably is what I propose briefly to show.

We will first consider the power plant.

In building the retaining walls and locks for the ship canal at Lockport and also at Joliet, the flumes and openings in the wall for the water power can be left at practically no additional expense, and what little there may be, the authorities will certainly feel justified in creating in consideration of the financial returns that they can obtain from a rental of the power. Therefore we have only to consider our discharging tail race or shunt around the ship locks, as far as the handling of the water is conserned. Such a tail race will necessitate the removal of less than 25,000 cu. yds. of material mostly rock. At Lockport this tail race would have to be constructed, but at Joliet it is very probable that the water could be discharged directly into the river at a very small expense. At the prices now prevailing in the country for this class of work, from 20 to 25 per cent lower than the prices currant at the the time the contracts for the drainage canal were let, owing largely to improved machinery, this excavation for both plants would cost less than $25,000. Adding $25,000 for the necessary retaining walls, would make this part of the plant cost approximately, $50,000.

The turbine wheels can be very easily made in pairs, each pair connected directly to the electrical generator, or whatever machinery it may be required to drive. With the head under consideration these pairs can be made of 3,000 horse power each, 20 such wheels, say 10 in each station, being required for the entire plant. Ordinary turbine wheels can be bought for $1.00 per horse power. Especially designed wheels, with necessary flumes, gates, regulators and erected in position, for about $5.00 a horse power. To cover special features however, and also the two station houses, which would not be expensive, I have estimated the cost of the entire power plant with the turbines ready to run at $500,000, or $10.00 per horse power. This figure can certainly be very considerably reduced.

Next, we must consider the method of utilizing this power, but more especially, in the present instance, its transmission to Chicago, a distance of 40 miles. To transmit this power by hydraulic pressure, even if practicable, is out of the question in the present case, as the only water available in sufficiently large quantities is from the canal, and there would be objections to returning the sewerage back to the city in this way. Compressed air is more feasible, but compressed air engines are not economical, and neither is the use of compressed air, unless it is reheated before being used, and also transmitted at a comparatively low pressure, which means large pipes. In point of convenience, ease in handling, adaptability and economy in transmission and use, electricity as a motive power, stands foremost at the present time. In the development of the immense water power at Niagara and its transmission to Buffalo, all these different methods were carefully considered and electricity finally adopted. By the use of electricity about 80 per cent of the power developed by the turbines can be delivered to the consumers in Chicago; certainly a better showing than is made by the compressed air plants now in operation.

Adopting electricity, therefore, as the means of transmitting this power, the alternating current is selected on account of its flexibility, ease of conversion and the high voltage it enables us to use in its transmission, thus effecting an immense saving in copper. A low number of alternations per second, not exceeding 30, is selected so as to avoid the induction losses which would be excessive at a higher frequency. The use of this low frequency may interfere somewhat with the use of arc lights on the circuit directly, but by the use of proper rotary transformers this can be rectified. For all other purposes there is no objection to this frequency.

As it is not advisable to build generators of too high a voltage the generators in question should have a voltage of about 2,000 volts, and in order to be directly connected to the turbines, of 3,000 horse power, or 2,250 k.w. capacity each. It would be preferable to make these as large as possible and a careful consideration of the turbine wheels to be used might enable their size to be increased. The polyphase current would be adopted as offering numerous advantages over the single phase, especially in the use of motors, and the three phase instead of the two phase current on account of the great saving in copper in the transmission line, a very important consideration when the energy must be conveyed 40 miles. Step-up transformers changing the voltage from 2,000 to 20,000 volts should be used, as it would be impracticable to transmit this energy 40 miles at a low voltage on account of the immense amount of copper necessary. It requires 3,000 tons of copper at 20,000 volts. If we used 2,000 volts instead, one hundred times this amount, would be required for the line, with the same percentage of loss. For the purpose of avoiding the inductive and condenser losses on the line an overhead pole line is very much preferred, and this can be constructed very nicely along the banks of the canal. Owing to the inductive effects of large wires, comparative small wires are desirable, and consequently the circuits must be subdivided. In this case No. 0 wire has been selected. It will require 30 circuits of three wires each of No. 0 wire to transmit the energy in question with a 10 per cent loss. This will require 3,600 miles of No. 0 wire weighing over 6,000,000 lbs. As illustrating the importance of the size of the wire with inductive currents, if 0000 were used, it would require one-third more copper. The line has been computed on the basis of a 10 per cent loss of energy, as probably the most economical in the present instance. Mutual induction between the circuits can be avoided by cris-crossing the wires on the pole line so as to counteract any mutual inductive effect between the adjacent circuits. Bare copper wire has been selected not only on account of its cheapness, but also because any ordinary insulation could not be relied upon at the voltage contemplated, so dependance will be placed upon the best grade of insulators for the insulation. A distance of 12 in. between the wires has been selected, as establishing a partial balance between the inductive and condenser effects. It is probable that with a very large load of motors on the circuit, as will be the case, the inductive losses on the line would be somewhat greater than has been taken. A considerable margin has been allowed for this in figuring the line, and the difference in phase caused by the highly inductive load can be rectified by the use of condensers. The use of synchronous motors, especially in the larger sizes, would also tend to prevent distortion of phase due to inductive losses.

For the purposes of this paper, the distribution and utilization of this energy for power purposes in large units is all that is contemplated. For local distribution, especially for lights and small powers, a local company would undoubtedly be organized to carry out that part of the business, or power could be furnished to the companies at present engaged in electrical generation. It is therefore probable that the power transmitted to the city would be utilized in units of considerable size, either by direct transformation to currents of lower voltage, suitable for general distribution for lighting and power circuits, or local transformation for power purposes at the plants of large consumers. These step-down transformers have been considered in the estimated cost of the plant hereafter made but not the local distribution from these to the general consumer, as that is not essentially different from the methods already employed by the present companies, and presents no difficult engineering problems. Suffice it to say, that the alternating current can be distributed with greater economy and a more efficient and better balanced service than is possible with the direct current, when proper attention is paid to its details. Polyphase motors are also more efficient and require much less attention than direct current motors.

In the foregoing discussion, a 2 per cent loss has been assumed in the step-up and also in the step-down transformers; a 10 per cent loss in the line, and an efficiency of 95 per cent in the electrical generator, and 85 per cent in the turbine wheels. Apparatus is in use to-day showing fully as good results as have been assumed, and there is no reason why these figures cannot be equaled, if not improved upon in the plant under consideration. These efficiencies have of course been assumed under the conditions of full load, but the efficiencies of the apparatus as manufactured to-day would be only slightly less at any probable underload, while the losses on the line would be decreased. At full load, according to the above figures, the consumers would be furnished with 82 per cent of the power received from the water wheels, and it is not probable that the efficiency of transmission would fall below 75 per cent, under any ordinary conditions of underload.

From the above it is readily seen that there are no serious difficulties in the way of transmitting this power to the city from an engineering standpoint. Financially the project is even more attractive. The following estimate has been prepared from actual figures which have been submitted to the writer by manufacturers, but in all cases increased in size to cover unexpected contingencies, and also the extra cost of getting only the very best of everything, irrespective of cheaper apparatus that might be obtainable, but possibly of inferior grade.

ESTIMATED COST OF PLANT.

Water power plant, turbines and buildings complete..	$ 500,000
Tail races and discharges	50,000
Electric plant, including generators, transformers, etc.	1,250,000
Transmission line, 3,600 miles No. 0 wire, pole line, etc..	1,000,000
Distribution, sub-stations in Chicago	50,000
Engineering and sundries	150,000
Total cost	$3 000,000

INCOME AND EXPENSES.

Rental of 50,000 h. p. at $25 per year		$1,250,000
Interest on investment at 4 per cent	$120,000	
Depreciation at 4 per cent	120,000	
Repairs and supplies	10,000	
Labor and superintendence	40,000	$ 290,000
Excess of income over expenses		$ 960,000
Deducting $5.00 per h. p. rental to Drainage District...		250,000
Net income		$ 710,000

Or 27 per cent on the investment.

As will be at once seen from the above estimate, it is very liberal. In all probability the cost of the plant can be kept below two and one-half millions. The charge of 4 per cent depreciation on such a plant is excessive, as much of it is subject to but little, if any, depreciation. The interest charge is hardly an operating expense, but is put in on account of the prevalent custom to-day of bonding an enterprise to the full extent of the investment, thus making the interest a first lien on the income.

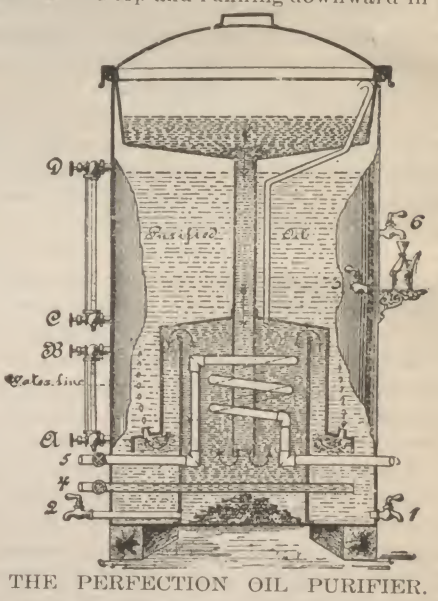
The charge of royalty or rental on the part of the drainage district is an uncertain quantity, so it has been estimated at $5.00 per h. p. per year. This to the writer would seem to be an ample charge as compared with similar charges made at Niagara, but under very different circumstances.

The price charged consumers for the power, $25.00 a year per horse power is, I think, perfectly practicable. According to the best estimates, it costs large consumers of power between $30.00 and $40.00 a year for power where it is produced by steam in large quantities. It costs small consumers very much more than this. A sliding scale of charges should, of course, be adopted according to the amount of power used. Consequently there should be little difficulty in disposing of the power at an average price much above that assumed in the estimate.

It was the original intention of the writer to take up some of the problems of the use and distribution of this electrical energy in the city, and the possible effects it might have, but this paper has already assumed sufficient proportions. Suffice it to say in conclusion, that we can scarcely over estimate the importance of the drainage and ship canal as a source of power to the city of Chicago, and that both from an engineering standpoint and financially it offers a very attractive field for our attention.

THE Q. & C. PERFECTION OIL PURIFIER.

A new oil purifier has been brought out by the Q. & C. Company which differs from the ordinary forms of oil filters in that no substance such as waste, asbestos, or other mechanical obstruction is placed in the path of the oil whereby dirt may accumulate and after a time render the oil less clean than it was before going through the apparatus. The device is shown in section in the accompanying illustration in which it is seen in exterior appearance, to consist of a cylindrical casing with a metal cover and a shelf upon one side to hold the cans while drawing the oil for use. The interior of the purifier contains a sheet iron arrangement of tubes and partitions plainly seen in the illustration which is passed into the casing from the opening at the top. From the bottom of the casing a cylinder projects upward at the center in which a steam coil is placed with which the pipe 5 connects. Pipe 4 passes into and through this cylinder and the cock 2 is placed upon its end by which the inner cylinder may be drained. The large casing may be drained by the cock 1. Two gage glasses are provided at A B and C D. When the apparatus is ready to receive the oil, water is placed in the basin at the top and running downward in the direction shown by the arrows it is allowed to rise in the bottom part of the casing to the point marked "water line." Oil is then placed in the basin until the interior chambers at the bottom of the purifier are filled and the oil is ready to pass over into the narrow angular space and up and through the small perforations into the water chamber. Steam is then turned on to the pipe 5 and the temperature of the oil around the pipe is raised to about 115 deg. The heating thins the oil and causes much of the dirt therein to be deposited in the bottom of the central chamber. It is, however, further purified by washing as it comes in contact with the water through the small opening shown.



THE PERFECTION OIL PURIFIER.

The purifier also is a reservoir for the clean oil which may be removed from the cock 6 or 3 according to the hight of the supply in the reservoir. An excellent feature of this device is the arrangement whereby it may be cleaned. Steam may be turned on through valves 4 and 5, while the purifier is full of water and the dirt washed out through the cocks at the bottom. It is claimed for this apparatus that its work is equally well performed before and after cleaning and as it employs no filtering medium but water it will not deteriorate with use. One of its strong points is that oil which is in process of purification does not come in contact with any dirt which has been previously separated from other portions of the oil. The work is done rapidly and no attention is required except to place the oil which is to be purified into the apparatus and apply the heat. There is no loss of the oil in the process. This apparatus has been used by a number of well known railways and manufacturing firms which is an excellent indication of its ability to substantiate the claims made for it. The general offices of the Q. & C. Company are 700-707 Western Union building, Chicago, Ill.

Rules Governing Applications for Patents in Peru.

The following is the translation of the official copy of the rules now governing the application for patents in Peru:

1. Whereas, the concrete form of letters patent does not convey an understanding of the details of the invention or improvement referred to, it being impossible to insert in the said form the extensive descriptions of the details

which in accordance with the law of January 28, 1869, accompany the respective applications;

2. Whereas, the said mode of procedure occasion difficulties the removal of which should be attended to by suitable rules, in which the present laws are deficient, and until congress pass the project now pending before the honorable house of senators;

3. Whereas, the disposition of the law referring to the registering of trade-marks requiring that a duplicate description of the mark to be registered be attached to the ownership-certificate to be extended, is applicable to the present case; it is

Resolved, That applicants for patents shall submit with their applications a duplicate description and drawings of the object to which the patent applied for refers, the presentation of which is required by article 7 of the law of January 28, 1869. The said duplicate duly countersigned at the Director-General of Industries' Office shall be annexed to the respective patent as an integral part of the same.

To be communicated, registered, and published.

The four signatures of the most excellent council of government. (Signed) MALPARTIDA.

NOTICES OF PUBLICATIONS.

Mr. E. W. Beedle has revised and re-issued his "Vest Pocket Freight Tariff," naming rates between Mississippi river points (East St. Louis to East Dubuque, Ill., both inclusive), and prorating percentage points in Illinois and Atlantic seaboard and other eastern cities, effective March 2, 1896. The tariff question has been checked by all the lines represented therein, and is, therefore, absolutely correct. It also contains the rates to and from the western termini of trunk lines on the new basis, which becomes effective April 13, 1896, as well as the present rates to and from the territory referred to. A large number of changes have been made since the last issue, in the percentage points and differentials, also a lot of additional commodities have been added to the Mississippi river bridge tariffs.

COMPUTATION RULES AND LOGARITHMS. With tables of other useful functions, by Silas W. Holman, professor of physics at the Massachusetts Institute of Technology; New York, MacMillan & Co., 1886. Price $1.

The aim of this book, as the author states in the preface, is to provide a method by which the student or engineer who has computations to make can economize time and labor through an intelligent command of his use of figures, and to decide at a glance what number of places is sufficient for the purpose in hand. It is stated that one-half of the time expended in computations is wasted through the use of an excessive number of places of figures, and through failure to employ logarithms. The author's purpose is to enable this waste to be avoided by following a few simple computation rules. He states that in direct or logarithmic multiplication and division with four, five and six figures, the work is respectively in the ratio of one, two, three, or perhaps more nearly two, three, four, showing that the work is doubled or trebled by the use of six places instead of four, and that the proper employment of logarithms on work of four or more places effects the saving of one-fourth and upward in the time required for direct multiplication or division, with a lessening of fatigue and a gain of accuracy. The first chapter in the book is one of the most valuable in that it contains simple rules to enable one to answer the question as to how many places of figures ought to be used in a given computation. The tables themselves occupy a little more than half of the book, the rest of the space being devoted to rules and instructions in regard to the use of the tables. The rules are very simple and direct and were evidently prepared with a view of their being easily retained in the memory, and to aid in fixing them in the mind the principal portions of the rules are printed in bold faced type. The thor was led to prepare these rules for the use of large classes of students among whom he found the need of them to exist, and on account of recognition of a similar need on the part of engineers and others who have computations to make requiring rapidity and accuracy. The tables are very well arranged and are exceedingly convenient, as it would appear from an experiment with them; and it is apparent that they are considerably improved over those in common use. The decimal points are not omitted, as is commonly the case. It is a question whether or not this constitutes an improvement. The pages are all indexed in the corners, and points desired to be made conspicuous are emphasized by the use of heavy type. Spaces instead of rules are used for the partition of lines and columns.

The following tables are included: Logarithms—Antilogarithms four place, co-logarithms four place, and logarithms five place. Square roots and squares, reciprocals, slide wire ratios, natural sines and co-sines, tangents and co-tangents, logarithms of sines and co-sines, tangents and co-tangents. The last seven tables are four place, and these are supplemented by logarithms of sines, co-sines, tangents and co-tangents, with five places. The book concludes with a table of contents embracing those most often required in engineering and physical computation. The book is well arranged and well bound and the letter press is excellent. The paper is extra heavy and well suited to the purpose. The selection of type is also commendable in that the sizes are sufficiently large to be read without trying the eyes. The work which Prof. Holman has done will be appreciated by those who have much computation to carry on, and the only criticism offered is that it would have been better to have embodied the rules and instructions in a separate volume from the tables, for the sake of convenience in handling the tables in long series of calculations.

AN INTERESTING CATALOG has been received from the American Steam Casting Co., principal office, Thurlow, Pa., 62 pages, 6¾ x 8¼ in. (Not standard size.)

This catalog illustrates a large number of very heavy and difficult castings, and also smaller ones, weighing from a very small amount up to single castings of 67,135 lbs. The latter casting is a stern shaft bearing for the American Steamship Company's liners, and the material has a tensile strength of 68,200 lbs., and an elastic limit of 35,800 lbs. and an elongation of 20 per cent. A number of castings for gun carriages are illustrated, together with locomotive driving wheels; gear wheels weighing nearly 19,000 lbs.; trunions for Bessimer converters; bed plates for marine engines; stern frames, propellers, anchors, the American cast steel bolster, and other smaller work. A communication was recently received from this company as follows: "We note in your issue of Feb. 8, comments in regard to the bursting of fly wheels. We have been advocating for a long while the casting of fly wheels in steel; this will positively obviate any such difficulties as are now experienced in this detail." Those interested in the construction of fly wheels will do well to obtain a copy of this catalog, and investigate the applicability of this material for the purpose.

REMINISCENSES OF A RAILROAD ENGINEER, by W. Hasell Wilson, honorary member American Society of Civil Engineers. Philadelphia, Railway World Publishing Company, 1896.

This little volume of 62 pages contains an interesting account of the early history and development of the Pennsylvania Railroad, and treats of the early history of some of the canal projects and other neighboring railways. It is in the form of a narative, with personal reminiscenses, and will repay the reader, as it brings him into contact with a man who began to locate railroads before steam power was contemplated and who was afterward chief engineer of the Pennsylvania railroad during the trying times of the civil war.

TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street, New York City.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Tuesday in each month, at 8 p. m., at 12 West Thirty-first street, New York City.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meeting on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston, 1522 Monadnock building.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Engineers' and Architects' Club of Louisville has a monthly meeting on the second Thursday in each month, at 8 p. m., at the Norton building, Fourth avenue and Jefferson street, Louisville, Ky.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Engineers' Club of St. Louis meets on the first and third Wednesdays of each month, at the Missouri Historical Society building, Sixteenth street and Lucas place, St. Louis, Mo.

The Engineers' Society of Western Pennsylvania holds its monthly meeting on the third Tuesday of each month at 7:30 p. m. at the Carnegie Library Building, Allegheny, Pa.

PERSONAL.

Mr. W. H. Wetherell on last Monday assumed the duties of his new position as agent of the Erie lines for the northwest. with headquarters at St. Paul.

Receiver C. W. Smith, of the Atlantic & Pacific road, has appointed Mr. Don A. Sweet general freight and passenger agent, with headquarters at Albuquerque, N. M.

Mr. Henry Wood, formerly acting manager of the Choctaw, Oklahoma & Gulf, has been made general manager of the same road, with headquarters at South McAlester, I. T.

Mr. H. E. Leyton, who has been in the office of Mr. William Garstang, superintendent of motive power of the Big Four, has resigned and will go to Cincinnati to engage in commercial pursuits.

Mr. F. A. Malone has been appointed traveling freight and passenger agent of the Cincinnati, Jackson & Mackinaw for the territory south of the Ohio river, with headquarters at 436 Vine street, Cincinnati.

Upon application of the Mercantile Trust Co., of New York, Mr. Thos. M. King, second vice president of the Baltimore & Ohio, was on March 1, appointed receiver of the Pittsburgh & Western by Judge Buffington of the United States Circuit court.

Mr. A. A. Jennings, traveling agent of the Star Union Line (fast freight line of the Pennsylvania Co.) will hereafter be known as dairy traffic agent. He will give special attention to the dairy traffic under the direction of the western superintendent with headquarters at Chicago.

Mr. A. C. Michaelis, formerly commercial agent of the International & Great Northern at St. Louis, and prior to that time general freight agent of the Mexican Central, has been appointed general manager of the Guatemalan Railway and will leave for South America in a few days.

Mr. H. A. Boomer, superintendent of the Toledo, St. Louis & Kansas City, has tendered his resignation, to take effect March 15. Mr. Boomer states as his reason for leaving that he has been offered a position on an eastern road but that he has not yet decided as to his future action.

Mr. W. S. Crooks, chief clerk to engineer of maintenance of way Cooley of the Ohio Central, has accepted the same position with Chief Engineer Sherman, of the Wheeling. Mr. Crooks has been connected with the Ohio Central for two years and will make a good man for the Wheeling.

Mr. William Price, recently general agent of the Manistee Transportation Co., with headquarters at Manistee, Mich., and for a number of years contracting agent of the New York, Chicago & St. Louis at Buffalo, and also with the Wabash in the same capacity, has been appointed general agent of the Great Northern Railroad at San Francisco.

General Manager Howard Elliott, of the Burlington lines in Missouri, announces that Mr. D. H. Kennett is appointed general traveling agent, with headquarters at St. Louis. He will look particularly after the location of industries and the development of new business, and will also do such work in connection with its freight and passenger departments as may be allotted to him.

Mr. Chas. A. Beach, superintendent of the Buffalo division of the Lehigh Valley Railroad, has resigned, and Trainmaster L. H. Van Allen of Buffalo has been appointed acting superintendent in place. Mr. Beach has been in the employ of the Lehigh Valley road about 2½ years. He was formerly assistant superintendent of the western division of the New York Central.

Among the recent changes on the Chicago, Rock Island & Pacific Railroad, are the following: First Assistant General Freight Agent H. Gower is promoted to the position of general freight agent. Mr. E. B. Boyd, second assistant general freight agent has been made first assistant, and Mr. J. M. Allen, division freight agent, is made second assistant general freight agent.

The new traffic manager for the Baltimore & Ohio Southwestern is Mr. George S. Randolph, who like Mr. C. H. Goodrich, lately made traffic manager of the Alabama Northern Railroad, has been connected with the New York & New England Railway. On that road Mr. Randolph was general traffic manager until its absorption by the New York, New Haven & Hartford Railroad.

Mr. Harry Gower, heretofore first assistant general freight agent of the Chicago, Rock Island & Pacific Railroad, has been made general freight agent, vice Mr. J. M. Johnson, promoted. Mr. Gower has been in the service of the Rock Island for a number of years, having been appointed to his present position in 1888. Previous to that time he served as second assistant general freight agent of the same road.

Mr. John T. Wilson, late of Wilson, Walker & Co. of Pittsburgh, who is long and favorably known among the railway officials of this country, and Mr. J. D. McIlwain, now of Pittsburgh, Pa., the well known master car builder and one of the oldest members of the Master Car Builders' Association, have interested themselves in the Powell improved furnace, with headquarters at 1204-5 Carnegie Building, Pittsburgh, Pa., where they will be glad to greet their old friends, and new ones, too. The latchstring always hangs out

Announcement has been made through an official circular from Wabash headquarters, that Mr. G. D. Lund, at present assistant general freight agent of that road, with headquarters at St. Louis, will be transferred to Kansas City, having charge of all freight traffic for the Wabash west of St. Louis, under present title. Mr. P. W. Coyle is appointed assistant general freight agent in place of Mr. Lund, while Mr. Walter H. Wylie will succeed Mr. Coyle as commercial freight agent.

Col. J. E. McIntire, the well known contractor, formerly of Buffalo, N.Y., who has been engaged in construction work in Connecticut for several years, has again returned to western New York, having, as a member of the firm of Smith, McIntire & Co., taken the contract to build the link connecting the Dunkirk, Allegheny Valley & Pittsburgh Railroad at Falconer with the Jamestown & Lake Erie Railroad at Jamestown. M. E. G. Paradice of Buf

falo, as engineer for Col. McIntire, will superintend the work, which is to be pushed rapidly until its completion.

Mr. B. B. Mitchell, general freight agent of the Michigan Central road, has been appointed general freight traffic manager of the same road with headquarters at Detroit. Mr. Mitchell has been in railway service since 1867, at which time he entered the employ of the Blue Line Fast Freight at Detroit. He remained with this road until he was made general freight agent of the Michigan Southern, having served as tonnage and waybill clerk, claim and mileage clerk, chief clerk and general manager, and also as general manager of the Canada Souther Fast Freight Line.

Mr. J. M. Johnson, who for a number of years has been general freight agent of the Chicago, Rock Island & Pacific Railroad, has been appointed freight traffic manager to succeed the late William M. Sage, who died in this city about a month ago. Mr. Johnson has had years of experience in the duties which he now takes up. He also served one year as chairman of the Western Classification Committee, was a member of the Uniform Classification Committee, representing the Western Freight Association, and is at present chairman of the Western Trunk Line Committee.

Mr. H. S. Morse, who since 1886, has been engaged in railway construction both in the United States and Canada died last week at Volusia, N. Y. Mr. Morse entered railway service in 1855 with the Williamsport & Elmira Railroad, and in 1861 he became assistant superintendent of that road. Subsequently he was superintendent of the Albany & Susquehanna, master of transportation of the Chicago division of the Baltimore & Ohio, superintendent of the Indianapolis & Decatur, superintendent of construction of the New Orleans & Texas Pacific, and general manager of the Brunswick & Western.

Mr. P. S. Blodgett, at present assistant general superintendent of the Lake Shore & Michigan Railway, has been appointed general superintendent, vice Mr. W. H. Canniff, promoted. Mr. Blodgett has been connected with the Lake Shore since about 1866. His first work was as a clerk in the office at Adrian, Mich. Afterwards he was a clerk in the office of Division Superintendent Curtiss. Subsequently he was track master in the engineering department of the Western division. He was promoted to the superintendency of the Detroit division, and in 1880 was made agent of the Chicago station. About six years ago he was appointed superintendent of the Eastern division, holding the position till January 1, 1892, when he was made assistant general superintendent.

Mr. Joseph W. Sherwood has been appointed division superintendent of the Toledo, St. Louis & Kansas City (Clover Leaf), with headquarters at Frankfort, Ind., to succeeed Mr. H. A. Boomer, recently resigned. Mr. Sherwood is well known in railroad circles, although he has been out of the service for some years. He was born at Nashville, Tenn., in 1850, entering railway service in 1864 as telegraph operator and station agent at Delphi, Ind., for the Indianapolis, Cincinnati & Lafayette division of the Cleveland, Cincinnati, Chicago & St. Louis, remaining with that road in various capacities until 1887, when he was made general superintendent of the Chesapeake & Ohio. He retired from this position after holding it but a few months and also from railway service.

Mr. Chas. L. Colby, of New York, formerly president of the Wisconsin Central Associated Lines, died at Newton Centre, Mass., on February 26, where he had been invited to deliver an address before the Woman's Baptist Foreign Missionary Society. After taking his seat he was seen to fall forward as if in a faint and on being carried into the church parlors, died in a few minutes from heart failure. Mr. Colby was about sixty years of age. He came to Newton fifty years ago with his father, was educated in the public schools of Newton, graduated from Brown University and was one of the board of fellows of that institution. He was an active railroad man, and for many years chairman of the board of directors of the Northern Pacific. Mr. Colby had been in poor health for some time, and had just returned from a trip abroad, where he had been in search of health.

A number of prominent changes among the traveling passenger agents of the Southern Railway have been announced. Mr. P. S. Gilmore, northwestern passenger agent with headquarters at Chicago, and J. M. Means, southwestern passenger agent with headquarters at Houston, Tex., have resigned. Mr. J. C. Beam, western passenger agent located at Little Rock, Ark., has been transferred to Chicago while the territory of Major Andrews of New Orleans is to be extended to include that formerly covered by Messrs. Beam and Means. The territory of Mr. Hunter Doll at Chattanooga, is extended to cover the state of Ohio, while that of Mr. J. L. Meek at Knoxville is extended to cover the fourth division from Chattanooga to Asheville, and the state of Virginia, West Virginia and Maryland from Hagerstown south, and the Marietta & North Georgia south to Marietta, Ga. It is said these changes are made simply in the interests of economy.

Mr. G. J. Grammar has been appointed general traffic manager of freight and passenger business of the Lake Shore & Michigan Southern, with which road he has been connected since October, 1894, in the capacity of general freight agent. Mr. Grammar spent his earlier business years on the Ohio river with packet lines from Evansville and points below. He was captain of a steamboat and superintendent of the mail line till 1881. Then he engaged with the Evansville & Terre Haute road at Evansville as general freight agent. Afterwards that road had a working arrangement with the Evansville & Indianapolis, Peoria, Decatur & Evansville, Louisville, Evansville & St. Louis, and Chicago & Eastern Illinois lines. Mr. Grammar became traffic manager of all these lines, and when they separated he was president of the Evansville & Terre Haute from 1892 to October, 1, 1893. In the early part of 1894 he was with the Chesapeake & Ohio Southwestern as assistant general manager in charge of the operation of the road, but in October entered the service of the Lake Shore.

Mr. Morris Barton Tooker, a well-known railroad man, died at his home at Niagara Falls on March 1 at the age of 70 years. Mr. Tooker began railroading on the Erie road over 50 years ago. He ran between New York and Dunkirk, and later from New York to Port Jervis. After six years' service he left the Erie and went on the Niagara Falls and Canandaigua branch of the Central road, running between the two towns mentioned. Next he saw service on the Lake Shore, where, in company with the late John Salt, of Buffalo, he is said to have run the first sleeping car in the country. Following this, he was with the Michigan Central, and still later with the Great Western Railway of Canada. Upon the consolidation of the Great Western with the Grand Trunk, he went back to the Michigan Central, but at the end of a few months he returned to the Grand Trunk. For nearly a quarter of a century Mr. Tooker had been connected with the Grand Trunk, and he was well-known along all the roads of Western New York and Canada.

Mr. W. H. Canniff, since 1890, general superintendent of the Lake Shore & Michigan Southern road, was this week made general manager of that road. Ever since the late John Newell was promoted from the position of general manager in 1875 to that of president, the road has practically been without a general manager, the president performing the duties of both positions. Mr. Canniff, the general manger, was born in Litchfield, Mich., in 1847. He entered the railway service in 1863, as a night watchman at Osseo, Mich., for the Michigan Southern & Northern Indiana road. In February, 1895, he was given the pesition of station dgent at Trenton. In August, 1868, he was made joint agent for the road named, and the Louisville, New Albany & Chicago, at Salem Crossing. Four years later he became trackmaster of the Kendalville division of the Lake Shore & Michigan Southern, in which capacity he served until 1879, when he was given a like position on the Chicago division. In the autumn of 1880 he was made superintendent of the Lansing division of the Lake Shore, with jurisdicition over the Detroit, Hillsdale & Southwestern and the Fort Wayne & Jackson roads. This position he held till appointed in 1889, assistant general superintendent of the entire system. On New Year's day, 1890, he was promoted to general superintendent, a position which he held until his promotion two days ago.

Mr. F. D. Adams, who for the past twenty-six years has been master car builder of the Boston & Albany road, has tendered his resignation owing to advancing age and indifferent health. Mr. Adams is a native of New England, having been born in Canterbury, Conn., in 1822. He began railroad work in 1859 as master car builder of the old Buffalo & Erie road, which is now a part of the Lake Shore & Michigan Southern. In 1868 he was made superintendent of the Ohio Falls Car Co. at Jeffersonville, Ind., remaining in that position two years, when he accepted the position he now resigns. A touching scene took place on the afternoon of February 28 at the Allston car shops of the Boston & Albany Railroad, when the retiring master car builder of the road was presented with a purse of money by the employes of the car department of the road. The gift consisted of a very fine alligator purse containing the sum of $233, and on the inside of the purse was written in gold letters: "Presented to F. D. Adams by the employes of the car department of the Boston & Albany Railroad. March 1, 1870—March 1, 1896." Nearly 300 of the 600 employes of the department of the road were present. The presentation speech was made by Mr. John M. Ford, chief clerk of the car department. Mr. Adams was greatly touched by the marks of esteem displayed by the employes of the road and thanked the men for the gift.

RAILWAY NEWS.

Baltimore & Ohio.—On March 2 the Baltimore & Ohio road was made defendant in another big action brought by the Mercantile Trust Co., of New York. Suit is brought for $1,000,000, which is alleged to be due as a failure on the part of the defendant company in violation of a contract. The contract which the company failed to perform and which is the motive of the suit is a contract to pay the Mercantile Trust Co., or order, on demand the sum of $1,000,000 in gold coin of the United States at 6 per cent per annum. On the same date this road which is one of the oldest and most extensive transportation systems in the United States, and until recently one of the most profitable, confessed its insolvency and was placed in the hands of receivers. Mr. John K. Cowan, its president, and Mr. Oscar G. Murray, its third vice president, were appointed receivers, and will hereafter operate it for the benefit of the creditors and bondholders, under the direction of the United States court. For several years the road has been losing money, and while the collapse, coming at this time, was a surprise to many, but few believed that it could be averted much longer. Since the last regular meeting of the directors, two weeks ago, Major Alexander Shaw, chairman of the finance committee, and President John K. Cowan have spent a great deal of time in New York, endeavoring to borrow enough money to provide for a large floating debt and payments of interest amounting to $400,000 falling due March 3. It was thought at one time that they would be successful, but President Cowan gave up the fight and returned to Baltimore. Immediately upon his arrival he called a meeting of the directors for the same afternoon. This was fully attended and took place about 4 o'clock. After a session lasting one hour and a half the directors and legal officials of the road repaired to the United States court room in the Federal building and General Counsel Hugh Bond filed an application on behalf of the directors asking for the appointment of receivers, upon the showing made in the petition that the company was insolvent. United States Circuit Judge Goff of West Virginia, who had been called for that purpose, in conjunction with United States District Judge Morris, heard the application, and there being no objection granted it.

One of the recent deals of the company is the securing of terminal facilities at Cleveland, O., and when the contemplated improvements are made it is thought the road will have the most valuable dock property in the city, and the move will mean much for this port. The railroad company has for some time owned about 1,900 ft. adjoining the property of the Valley R., and it has lately acquired 2,500 ft. of dock, extending up the river, which now gives it a dock frontage of 4,400 ft., or almost a mile. The dock will be repaired and rebuilt, and the contracts have been made for car-dumping and other machinery for the rapid handling of cargos. These improvements, according to the estimates made and approved by the company, will cost more than $500,000, and it is said to be the present intention to put a large force of men at work and push them to completion as rapidly as possible. It is thought that the company intends also to erect grain elevators and transfer grain that is now handled at other ports.

Chesapeake & Ohio.—The Cincinnati Enquirer says: "The Big Sandy division of the Chesapeake & Ohio road is being prepared for extensive improvements this season. There has been such a material increase in the population and business that such a step has become necessary. The road will be entirely overhauled. The road bed will be reballasted and new ties laid. Grades will be cut down and several curves straightened out. Heavier rails will replace those now in use, and it is not at all improbable that the road may add several miles of extension. That must be done very soon, if not this season. The present train service is engaged in hauling as much material as possible. A new time card and additional facilities in a better outfit, faster time and new coaches will be inaugurated as soon as the improvements are completed."

Cincinnati, Lebanon & Northern.—The sale of the Cincinnati, Lebanon & Northern R. is again announced. As it is something more than a month since the last sale was announced, and as a definite date (March 16) is published before which stock must be delivered, it may safely be assumed that there have at least been negotiations.

Cincinnati Southern.—The terminal facilities bill presented by Senator Shattuc in the Ohio legislature and designed chiefly to provide terminal for the Cincinnati Southern, has, in an amended form, received the approval, nearly unanimous, of the Cincinnati chamber of commerce. It is intimated, however, by another senator from Hamilton county that the proposed amendment will make its passage more difficult.

Concord & Montreal.—At a meeting of the Concord & Montreal R. directors at Concord, N. H, on Feb.25 it was voted to purchase what is called the Lamprey land at the south end of that city, covering 25 acres, for the erection of a general repair shops. This means much for Concord, as it will transfer business to that city which will engage several hundred additional workmen. It was also voted to authorize the construction of a new passsenger station at Manchester, which will cost not less than $300,000.

Green Bay, Winona & St. Paul.—The sale of the Green Bay, Winona & St. Paul road which had been set to take place March 3 has been postponed 30 or 60 days because of a stay secured by Mr. Mowry in an appeal of his case to the higher court of Wisconsin. This case involves the question of prior right of $105,000 of underlying bonds which never went into the prior reorganization. The lower court decided against him and he appeals the case. This delay in the sale of the road is especially annoying to the committee because it is fully prepared to otherwise reorganize and make rapid headway developing the property. The net earnings for last year increased about 50 per cent over the previous year, and this in spite of operating expenses of 83 per cent. The amount of the net earnings, if applied to the proposed plan, would give a good return on all the new securities.

Kansas City, Pittsburg & Gulf.—Official announcement has been made that the Kansas City, Pittsburg & Gulf R. will be opened for traffic Sept. 1 next, making what is claimed to be the shortest possible route from Kansas City to deep water on the Gulf of Mexico at Sabine Pass. The road has been chartered and used for traffic for some time from Kansas City to Stillwell, I. T., 258 miles. It is reported that contracts for constructing the Kansas City, Shreveport & Gulf, which is the name of the southern extension of the K. C., P. & G., from Shreveport south have been awarded for a distance of 75 miles and the work is covered this distance by a large force of graders. The engineer corps are pushing the work of location through Sabine and Vernon parishes and will have the permanent locations of an additional 75 miles ready for the contractor in a short time. The grading of the Port Arthur & Beaumont line is practically completed, and track laying on this section of the road will be commenced in a few days. North of Beaumont the engineers are crowding the location, and it is expected this part of the line will be ready for the contractor in a short time. The road from Kansas City to Shreveport will be completed and in operation by the middle of March, as will also the road from Port Arthur to Beaumont, Tex. The gap of 60 miles north of Texarkana is covered with a large force of men and teams and the work is being crowded to its utmost. The forces now employed aggregate about 3,000 men and 1,200 teams; 35,000 tons of steel rails for the gulf extensions are being delivered at the rate of 5,000 tons monthly from the rolling mills. Contracts for the furnishing of 800,000 cross ties have been awarded to Messrs. Signor, Burton & Co., of Sodus, La. Four track laying machines have been contracted for to push the work of track laying vigorously from the various points mentioned. Shreveport and Beaumont are feeling the prosperity coming with the new road to a very liberal extent, and it is said that from the day it was decided the Texas division would come there everything and everybody felt the effect. Contracts for buildings are being let, workmen who have been idle have secured work, and, in short, confidence in investment has been restored. The same reports come from Shreveport and the people thank the new road for the improvement in business. When completed the road will be 769 miles in length and is backed by Holland capital.

Memphis & Charleston.—A committee consisting of Adrian Iselin, Jr., Frederick Cromwell, W. Emler Roosevelt, and E. N. Gibbs has been appointed to reorganize the Memphis & Charleston Railroad and request holders of securities of the company to deposit the same with the Guaranty Trust Co. of New York on or before April 1. The plan provides that holders of the common stock may purchase the income bonds of the new company under the terms of the plan on payment of an assessment of $4 per share, payable in installments.

New York, Pennsylvania & Ohio.—It was the general impression at the time of the Erie reorganization some months ago, that both the New York, Pennsylvania & Ohio and Chicago & Erie would be completely absorbed by the

new Erie. But at Columbus on Friday last there was incorporated the New York, Pennsylvania & Ohio Railroad Co., with Charles E. Whitehead, John Tod, E. R. Perkins, Alba Mark Tucker and John H. Dynes as incorporators, with $15,500,000 as its capital stock. Within a few days there will be incorporated a new Nypano railroad company with a capital stock of $4,500,000. Then the Ohio Company and Pennsylvnnia company will consolidate, with a capital stock of $20,000,000, which consolidated company will also be incorporated under the laws of Ohio and pay over to the state of Ohio one tenth of 1 per cent, or $20,000. This new consolidated Nypano R. Co. will then issue bonds to the extent of $20,000,000. The stock and bonds will be owned by the Erie R. Co., and will represent the supposed value of the Erie securities which the Erie is now giving to the old Nypano security holders in exchange for their stocks and bonds. The face value of these Erie securities is about $35,000,000; the new Nypano stock of $20,000,000 and bonds for the same amount will therefore constitute a valuable asset of the Erie Co. The Nypano, as thus organized, will be leased to the Erie and operated by it, the same as now. The consolidation of the Erie and Nypano may be made later.

Ohio River System.—The Ohio River System represents 60 per cent of the river boats built and 71 per cent of total river tonnage. The special committee of the Cincinnati chamber of commerce to report the value of the commerce of the Ohio river, has published statements, showing that more tons of freight are carried and towed annually on the Ohio River System, than on both the upper and lower Mississippi systems and that the rate of increase has been much greater on the Ohio than on either of the other principal systems, but that the total appropriations to 1893 have been about half that for the lower Mississippi system and about two-fifths that for the upper Mississippi system.

Pennsylvania Co.—Reports from Ohio state that the Pennsylvania R. Co. is contemplating some electric line construction in northern Ohio. It is said that a corps of engineers has been over various lines in that vicinity and has run preliminary lines to Barberton, Turkeyfoot lake and other points, and is preparing a full report for the company on the question of cost of applying electricity to the old Massillon & Cleveland branch line, and of building spurs into new territory. These facts have doubtless given rise to the report published in some of the local papers concerning the construction of a Pennsylvania electric line to parallel the present main track between Massillon and Canton.

Pittsburgh & Western.—A bill applying for a receiver for the Pittsburgh & Western alleges that the defendant company has an outstanding indebtedness in bonds and mortgages of $16,240,000. The Pittsburgh & Western is a part of the Baltimore & Ohio system running from Pittsburgh to Chicago. The receiver is required to give a bond of $50,000.

This company is reported to be about to lay heavier steel along the main tracks and principal sidings between the place where the West Pennsylvania Railroad intersects and lower Allegheny. Some of the heavy rails have already been distributed.

St. Louis Terminal.—At the annual meeting of the Terminal Association of St. Louis and its subsidiary companies held last Tuesday morning at the Union Station, all the proprietary interests were represented—that of the Missouri Pacific-Iron Mountain, Wabash, Louisville & Nashville, Baltimore & Ohio Southwestern and the Cleveland, Cincinnati, Chicago & St. Louis. The report of President Taussig was read and adopted. The old directors were re-elected, only two or three changes being made. Mr. W. S. McChesney succeeds Mr. E. P. Bryan as representative of the Louisville & Nashville. The meeting of the new board for the purpose of organization will be held next week, and while nothing has been confirmed it is generally understood that Mr. Julius S. Walsh will be made president and that General Manager Bryan will become vice president while retaining the title and duties of his present position. It is not expected that any important changes in the subordinate staff will follow.

Southern Pacific.—Last season the Southern Pacific completed 25 miles of double tracking from New Iberia to Franklin, in Iberia county, Louisiana. It was not the intention of the company at that time to do any more double tracking, but it has been thought best to add five more miles and so for the past few weeks workmen have been engaged in grading between Bayou Sale and Franklin. The progress made upon this double tracking is very satisfactory to the company. The track will all be completed in a short time and then the Southern Pacific will have about 30 miles of double tracking. The company is now also engaged in ballasting the road from New Orleans. It owns its ballast pits and it is said that the material is of the best kind, placing the road in first class condition every way. The road from New Orleans for some distance out of the city is probably to-day in better condition than half of the roads in the country.

Tennessee Central.—This company has been reorganized and Major C. O. Godrey who last October was made receiver, has been elected president. Since his appointment as receiver, Mr. Godfrey together with Mr. W. R. McIntosh, president of the Tennessee Improvement Co., has been engaged in the effort to get the matters of these two companies into such shape as would enable them to raise money with which to complete the road from Monterey to Clinch river and the Cincinnati Southern, a distance of 65 miles. The indebtedness is about $300,000 and the terms of settlement that have been accepted by a large number of the creditors, are 25 per cent cash or 50 per cent bonds in 90 days, which is a basis which will enable the receiver to assume the work. Messrs. Godfrey and McIntosh have secured financial backing from eastern financiers in the sale of the receiver's certificates, and Mr. Godrey states that he has let the contracts and expects to complete the grading of the 65 miles of road by June 1, and to have the rails laid and the road in operation to the Cincinnati Southern by the middle or last of August. The original contractors, Newton & Co., A. Tubman and McFarland, have entered into new contracts at reduced rates for cash, and the road will be completed with free labor instead of convict labor. Mr. R. L. Engle, formerly of the Santa Fe system, is the chief engineer of the line and Mr. W. T. Carley is engineer of bridges and buildings.

NEW ROADS AND PROJECTS.

Florida.—It has been learned through dispatches from Tampa, Florida, that the Plant system contemplates the construction of a railroad from Punta Gorda to Ft. Myers, and that the work will be taken up in earnest as soon as the necessary preliminaries are arranged. Mr. Frank Hough, of Boston, who was in Tampa recently is reported to have been engaged by the Plant system people to go down to Punta Gorda and secure the right of way, and if such proves to be the case, the construction of the road may be looked upon as an established fact. The distance is about 35 miles, and the new road is one which is urgently demanded by the rapid development of Lee county.

Maine.—The Portland Extension R. Co. has filed articles of incorporation in the secretary of state's office at Portland, to build a new line from Westbrook to Gorham. The company was formed at Portland, with the following directors: William G. Davis, Wm. R. Wood and Charles F. Libby of Portland; Edward A. Newman of Deering, and Wm. A. Wheeler, of Brooklyn, N. Y. Capital stock, $50,000.

All surveys on the Washington County road have been made, and the working maps on which the constructing engineer, Mr. Henry Hill, of Augusta, has been employed, are now nearly completed. The road is to extend from Calais to Machias, via Eastport, and it is expected the work will be pushed as rapidly as possible after the spring opens.

Maryland.—The proposed Washington, Annapolis & Chesapeake is to be about 26 miles long, running from Washington to Annapolis and thence to some point on the Chesapeake Bay where connection is to be made by steamer with the eastern counties in Maryland, and the Atlantic coast. General J. B. Seth, who was formerly at the head of the Baltimore & Eastern Shore road, is said to be in the new enterprise, and Mr. R. S. Mitchell, of Washington, D. C., is the chief engineer. It is proposed to put an electric line along the same route with the steam road. The electric road would be used to carry freight and passengers between stations as a feeder for the steam road. The capital stock is placed at $500,000.

Minnesota.—The Minneapolis, Northern & Rainy Lake road, which was projected last fall to run from Minneapolis to some point at the west end of the Missabe Range, probably Fort Francis, Ont., is now said to be an assured fact, and that a section 75 miles in length between Minneapolis to Mora, Minn., is to be built within 10 months. When completed the road will be nearly 300 miles in length.

New Mexico.—Reports have been sent out that a construction company began work on the El Paso & Northeastern on Feb. 27. One force of men and teams will work at El Paso while another large force will be located 20 miles north. This road is to run from El Paso through the rich coal and mineral fields and gold camps of the White Oaks country to the town of White Oaks in Lincoln county, N. M., with the ultimate intention of extending it to Panhandle, Tex. Property owners at El Paso are delighted that actual work has begun, as they know the construction of this road means a big boom for El Paso.

New York.—A preliminary survey is being made for a new line between Forestport station on the Adirondack & St. Lawrence and North Lake and Horn Lake all in Oneida county. The line is to be 30 miles in length and will penetrate the Adirondack wilderness. The road if built will open up 150,000 acres of forest lands now inaccessible. The surveying party is working on snow shoes and proceeding under difficulties.

A link line is to be built connecting the Dunkirk, Allegheny Valley & Pittsburgh at Falconer with the Jamestown & Lake Erie R. at Jamestown. Col. J. E. McIntire, who has taken the contract for the new line, is now in Jamestown, and the tools are on their way, ready to be operated day and night. It is expected that 200 men will be placed at work at once in order that the road may be turned over completed to the owners by August 15. Soundings are now being made in the swamp near Jamestown, and after the piles are driven the roadbed is to be completed with earth taken from the excavations on the line.

North Carolina.—A company is about to be formed to build an electric road from Asheville to Rutherfordton, a distance of about 42 miles. This road, which at first was to be a steam road, will run via Hickory Nut Gap, in the Blue Ridge mountains. It was decided, however, that an electric road would be more available for the purpose. The road will connect with the Seaboard Air Line at Rutherfordton and give Asheville a connection with that road.

Ohio—Negotiations have been begun at Cleveland for the purchase of the Columbus, Lima & Milwaukee Railroad by a party of capitalists represented by Marcus Pollasky of Chicago. When the parties interested in this line began work upon it it was the intention to build from Columbus to Saugatuck, Mich., from which a line of steamers was to ply to Milwaukee, but after grading 42 miles of roadway from Lima to Defiance the panic struck the country and all work was abandoned. The Chicago men interested desire to complete the line to Bay City, Mich. Such a line would cross the Pennsylvania lines and the Baltimore & Ohio and give both an outlet into Michigan from Ohio. Northern Michigan would be the gainer by a direct line from Ohio and West Virginia coal fields. It is said that Mr. Pollasky feels certain the negotiations will end favorably to his clients.

South Carolina.—Surveys have been completed for the proposed branch line which is to connect the mill town of Spartanburg, S. C., on the Richmond & Danville division of the Seaboard Air Line with Henriette, N.C., on the Carolina Central. The line will be about 24 miles long, and is to be finished by June 1.

South Dakota.—On March 5 at Rapid City, S. D., articles of incorporation were filed for the Dakota Range Gold Co. The incorporators are Chas. S. Cryster of Pierre, and Jas. Cowan, Edward Mayer, and Robert Kolb, of Chicago. Capital stock, $700,000.

Tennessee.—Direct railroad communication between Chicago & Savannah, Ga., with double track and easy grades, is what is promised by the proposed extension of the Black Diamond R. system of Tennessee to the northwest and southeast. According to the expectations of Col. Albert E. Boone, president of the road, the distance between Chicago and Savannah will be reduced 1,015 miles, and in the entire stretch there will be no gradient exceeding in steepness the ratio of 66 ft. in the mile. At the present time the development of the system which it is proposed to make the nucleus of a great trunk railroad is chiefly in Tennessee, with extensions through Kentucky and the western end of North Carolina. The extension to Savannah along the northeastern boundary line of Georgia, is already in contemplation, and on Feb. 12 an application was made for a charter to construct a road through the state. Between Chicago and the main Tennessee line it is proposed to construct an independent line through Indiana, touching Indianapolis, and continuing its course through the central part of eastern Kentucky. As to the advantages to result from the construction the promotors have much to say not only regarding the possibilities of Chicago doing a greatly augmented trade with the remote southeast, but also concerning the facilities which the opening up of the Tennessee coal fields and marble quarries will offer to industrial enterprise.

Wisconsin.—A company has been incorporated in Wisconsin to build a road somewhat more than 80 miles in length to be called the Necedah Junction, Tomah, Richland Center & Montford Junction. The line will begin in Monroe county, and traversing Vernon and Richland counties, terminate in a connection with the Chicago & Northwestern road in Iowa county. The officials of the new company are C. E. Quigg, president; G. W. Reigle, vice president; D. J. Aller, secretary, and R. H. McMullen, treasurer, all of Tomah, Wis. Capital stock $150,000.

INDUSTRIAL NOTES.

Bridges.

—The contract for the construction of 575 lineal feet of medium steel plate girders on tubular piers and stone abutments at Cedar Falls, Iowa, for the Chicago Great Western Railway, has been let to Mr. Olaf Hoff, of Minneapolis, Minn.

—The St. Francis Lake Bridge Co., at Craighead City, Ark., intends to construct a new bridge.

—The railway committee of the Dominion Parliament has added some unimportant amendments to the bill to incorporate the Queenstown Heights Bridge Company and will report it to the House of Commons for passage. The bill empowers the company to build a bridge across the Niagara river from, at or near Queenstown to a point on the American side at or near Lewiston in Niagara county, N. Y.

—A C. Hinde, H. C. Wallerstedt and E. H. Perry, of Perry, Okla., have been appointed a committee to solicit funds for the building of four new bridges, two each, on Black Bear and Red Rock.

—The house committee on commerce has voted to report favorably the bill for a bridge across the Mississippi river in Aitken county, Minn, introduced by Mr. Towne, and Senator Pettigrew's bill for a bridge across the Missouri at Chamberlain.

—A dispatch from Topeka, Kan., states that the plans for a new bridge across the Kansas river are completed, and commissioners will at once advertise for bids.

—The Indiana Bridge Co., of Muncie, has secured the contract for building 750 ft. of a steel structure across the Menominee river at Marinette, Wis., for $6,192.

—The bids for a new bridge at Halsted street, Chicago, were as follows:

Lassig Bridge & Iron Works	$64,000
New Jersey Steel & Iron Co.	59,950
King Bridge Co.	54,500
American Bridge Co.	67,500

Bids were also opened for $50,000 worth of water pipe. Six bids were received, ranging from $23.50 a ton by the Howard Harrison Pipe Co., to $21.84, made by the Addyston Pipe & Steel Co. of Cincinnati.

—It is now stated that the work on the new bridge at Cincinnati which is connecting the Panhandle and the Louisville & Nashville roads, will be completed May 1. In addition to a double-track bridge for railroad service there will also be a double wagon road and a footway. The work of reconstructing the bridge has been a remarkable one, having been done without interfering with the use of railroad track or the footpath at any time during the progress of remodeling. The entire cost of the work will exceed $750,000, but of this amount nearly a half a million has been spent in the masonry approaches and additions to the stone piers. Two new piers have been built and the same number taken down in order to make such span over the channel as is demanded by river commerce. This span will be 510 ft. The total length of the bridge and approaches will be 3,700 ft., the bridge proper covering 1,650 ft. of that distance. The amount of limestone masonry is 2,400 cu. yds. Since the construction began, May 28, 1895, eleven hoisting machines, two dredging machines, two pile drivers, twenty flatboats, two tugs and the steamer Bellevue have been almost constantly engaged.

—Bids will be received by the Board of County Commissioners of Geary county until April 12 for the furnishing of material and construction of a bridge over the Republican river at Milford, Kas. Bids will also be received for an iron bridge, bidders to furnish plans and specifications.

—A bill has been passed by the house granting permission to construct a wagon and railroad bridge across the Missouri river at Pierre, South Dakota, thus practically insuring an extension of a railroad across the ceded Sioux lands between the two sections. The bridge bill passed the senate some weeks ago, and now goes to the president. The Amsterdam and New York capital has been interested in the enterprizie. The bill provides that work upon the bridge shall be commenced within one and completed within three years.

—It is reported that the King Bridge Co. has secured the contract for constructing the iron bridge over the Chagrin river, near Willoughby, O., for the Cleveland, Painesville & Eastern Railway Co. The woodwork has

been let to Brown & Co., of Willoughby, O., and the masonry to Williams Bros., of the same place. The bridge is to have two spans, one 200 ft. over the river, the other of 170 ft. over the road, with a 600 ft. wooden trestle approach.

—At a meeting of the board of directors of the Concord & Montreal, held at Concord, N. H., on Feb. 25, it was voted to authorize the construction of a new passenger station at Manchester, which will cost not less than $300 000.

—Contracts were let in Cincinnati this week for the construction of a bridge on Kenton street over Florence avenue, the substructure being given to Hayman & Harold at $11,267.50, and the superstructure to the Bracket Bridge Co. at $23,890.

—A steel bridge over the railway tracks at Watertown Junction, New York, at an estimated cost of $18,000, is projected.

—The contract for the 80 ft. plate girder bridge at Union City, Pa., has been awarded to the Grotan Bridge & Manufacturing Co. for $9,510, including masonry abutments.

—The Berlin Iron Bridge Co., of East Berlin, Conn., has been awarded the contract for the construction of a 150 ft. bridge over the Naugatuck river at Waterbury, Conn.

—It is currently stated that a bridge 200 ft. long will be built this year over the railway tracks at Newport News, Va.

—It is announced that the commissioners of Armstrong and Westmoreland counties, Pennsylvania, have agreed to build a bridge over the Allegheny river at Freeport.

Buildings.

—The East Birmingham, Ala., Smelting Works, which were burned some time ago, have been rebuilt in the city proper, on account of better facilities for handling the output, and will be known hereafter as the Smelting Works. The plant began operations Feb. 24. The industry turns out brasses for car axles and other articles in that line. The old works had plenty to keep it busy all the time. With the better location secured it is expected that the plant will grow to much larger proportions. All the machinery in the old plant was absolutely destroyed. The present plant is new in every respect.

—The Southern Railway has bought land at Salisbury, N. C., for new machine shops to be built at that town, mention of which has previously been made. These shops will do the repair work for the Western North Carolina division and the Northwestern North Carolina road, about 309 miles of road altogether. The shops will be of some extent, and will employ over 100 men at first.

—The St. Louis & Southwestern Railroad Co. expects to enlarge its shops at Tyler, Texas, in the near future, at a cost of $40,000.

—The Baltimore & Ohio Railroad Co. recently requested S. A. Souther to submit plans for enlarging and improving the Grafton shops. The receivership proceedings recently instituted may interfere with the project.

—Work has been started on the buildings for N. S. Bouton's Car Wheel Foundry at Birmingham, Ala.

—Owing to increased business the Texas & Pacific Railroad Co. will erect another grain elevator at Westwego, Louisiana.

—L. Johnson, general manager of the Waycross Air Line, is authority for the statement that temporary repair shops will be erected at once at Waltertown, where the shops were destroyed by fire a few days ago, but the company will in the near future remove the shops to Waycross. The general offices of the Waycross Air Line have recently been removed to Waycross from Waltertown.

—Preliminary work for the new joint freight house for the Seaboard Air Line and the Western & Atlantic will be begun at Atlanta in a short time. The contract for grading is reported to have been let, and the plans have been drawn for a structure which will cover a lot 200x900 ft.

—It is reported that the machine shops of the Western New York & Pennsylvania Railroad at Buffalo, which were destroyed by fire on February 16, are soon to be rebuilt.

—The building which the Keystone Axle Co. is erecting at Beaver Falls is 80x200 ft., of steel and iron, and will employ 150 men. The Penn Bridge Co. is doing the work. The foundations are laid, and it expects to be in operation in April. The company will roll car axles and merchant steel. Engines and boilers of 1,200 horse power will be put in. The company is using a process of treating steel discovered by Mr, Rowley, vice president, which greatly increases the tensile strength. The tests made by the Pennsylvania Railroad, Cambria Iron Co. and Hunt & Clapp, are reported as being very satisfactory. It is stated that Gen. Flagler, chief of the United States ordnance department, said that if they could accomplish what they claim, it would revolutionize the naval business. Some of the steel is now being tested by the government.

—The Erie Car Works, of Erie, Pa., in rebuilding its plant that was destroyed by fire two years ago, has added a blacksmith shop 52 x 75 ft. and 36 ft. high, to its car repair buildings. It is at present actively engaged with orders.

—The Richmond Steel Tie Mill Co., now located at Richmond, Va., contemplates moving its plant to Anderson, Ind., changing its name to the Chicago Steel Tie Mill Co. All contracts are stated to have been let and the new plant is to be in operation by July 1.

Cars and Locomotives.

—The Wabash R. R. Co. is taking bids on 500 box cars with an option for sixty days on 500 more.

—The Wisconsin & Michigan is in the market for 250 box cars.

—From Anniston, Ala., come reports of contracts for new cars, some already delivered, some in process of delivery as completed, and more to complete. The extent of the contracts has not been made public and their significance cannot therefore be stated. Besides the car contracts there are reports of contracts for car wheels, which lends color to the belief that we are but at the beginning of the contracts that will be made by the railroads for equipments. The most important change to be made among home institutions here is the converting of the dummy lines of roads into the trolley system, which is now being done. This will give quicker and more frequent communication between Birmingham proper and its various outlying suburbs. Its importance becomes apparent when it is known that Birmingham, with its various suburbs, claims a population of 100,000, while probably one-half or less of this number are within the limits proper of Birmingham.

—Twelve new locomotives for the Wheeling & Lake Erie are now about ready for delivery. They are receiving the finishing coat of paint at Cooke's Locomotive Works where they are being built. A special effort has been made by the builders to construct a locomotive which will be adapted to the heavy freight traffic and physical conditions of the Wheeling. This addition to the Wheeling's motive power will put it into excellent condition for the lake coal traffic when navigation opens.

—The Lehigh Valley Railroad has ordered from the Baldwin Locomotive Works five heavy engines for service over the Wilkes-Barre mountain. These engines will weigh in working order 148,000 lbs., of which 130,000 will be on the driving wheels. They will have American driver brakes on each wheel, and will be equipped with the Westinghouse air brake.

Iron and Steel.

—Burt H. Whiteley, of Muncie, Ind., writes that he has just received some very large coupler orders, and is making 250 complete couplers per day, running to his full capacity, melting about 65 tons daily.

—The Ironton Structural Steel Co., Duluth, Minn., contemplates extensive improvements, involving the expenditure of about $200,000, and consisting of a blooming mill to roll ingots of 3 to 8 tons weight, a hydraulic shear to cut blooms 42 in. wide by 5 in. thick, a 30-ton basic open hearth steel furnace, electric ingot charger, electric crane for changing rolls, soaking pits, etc. This concern has recently completed two 30-ton acid open hearth furnaces and a beam mill designed to roll beams up to 36 in.

—Matthew Addy & Co., of Cincinnati, has established an office at 975 the Rookery, Chicago, under the management of A. C. Hawes, for the sale of pig iron, old rails and old wheels. Mr. Hawes has a long experience in the pig iron trade in this territory, which will no doubt enable him to do a large business.

—The American Iron & Steel Works (Jones & Laughlin, Limited), at Pittsburgh, has bought a large piece of ground adjoining its present plant which will be utilized for additions that are soon to be made. Within a short time this firm will have one of the most complete and modern open hearth basic steel plants in the United States. It already has two 40-ton furnaces in operation and has let contracts to the S. R. Smythe Co., of Pittsburgh, for four more of the same capacity.

—The Anniston Pipe & Foundry Co., of Anniston, Ala., has purchased the pipe works plant in that city heretofore operated under lease, and will at once make important improvements.

—The new 8-in. mill at the Central Iron & Steel Co.'s plant at Brazil, Ind., has been started and is now working double turn. This mill will make smaller iron than has formerly been made and gives employment to between 30 and 40 persons on double turn.

—During the month of January the output of air brakes at the plant of the Westinghouse Air Brake Co., at East Pittsburgh, amounted to 13,000, which is the largest amount ever turned out by the company. The next highest record was made in November last, when 11,000 were made.

—The Paxton Rolling Mills, of Harrisburg, Pa., has just completed an order for 200 steel plates for the Baldwin Locomotive Works, every one of which passed inspection.

—The North Carolina Car Works at Raleigh, N. C., has a plant well equipped with the most modern tools for the rapid execution of orders. The works are situated on the Seaboard Air Line and also on the line of the Southern Railway thus enjoying ample receiving and shipping facilities. A recent addition to this plant is a fully equipped machine shop and wheel foundry, with every thing of the latest, where 200 car wheels can be turned out every day under the Lobdell system which is a guarantee of their quality. The location of these works in a region of cheap coal and iron, and first-class long leaf yellow pine, with low freight rates should make them a factor in low bids for cars with their growing business and the rapid development of the south, there would seem to be an excellent future for this enterprise.

—The Pennsylvania Steel Works, Steelton, Pa., reports an average output at the works during the past week. Four furnaces are in operation in the open hearth department with an average output of 280 tons per day. The rail mill was on 90½s, sec. 222, all week and made a good output. The rails are grooved and are used for the West End Street Railway of Boston. They are made in 40-ft. lengths. The machinists, bridge and construction and boiler departments are very busy. The frog, switch and signal department is not pushed with orders, having enough, however, to keep a full turn at work, which is divided between the day and night turns. The iron and steel founderies continue very busy on shipping orders. The two blast furnaces in operation are producing large quantities of spiegel and iron. Several cargoes of Cuban ore have arrived at Sparrow's Point. Large quantities of coal, coke, etc., were received this week. The shipments have been large. The rail department has been retarded somewhat in shipping by a want of suitable cars for the extra length rails now being rolled.

Machinery and Tools.

—Messrs. Fairbanks, Morse & Co. has justed completed at their works, Beloit, Wis., a larger hoister machine, probably the largest one ever built in the west, and it is to go into mines in Colorado. It has a capacity of 600 horse power and weighs 195,000 lbs.; will elevate a weight of five tons from a depth of 3,000 ft. at a speed of 1,000 ft. per minute. A cable 6 in. wide and ¾ in. thick will be used upon it. This firm has leased the Marshall Field building, northeast corner of Monroe and Franklin streets, Chicago, for a term of five years. The building is 90x100. The firm will move from its present location on Lake and La Salle streets to the new quarters about the first of May.

—That the Rand Drill Company compressors give most excellent satisfaction to railway men, is substantiated by the fact that it has this week received an order from the Atchison, Topeka & Santa Fe Railway for six air compressors, to be used in the different shops along the line of its road. During the month of February the company fitted up ten railway shops with its appliances.

—The Ranken & Fritsch Foundry and Machine Company, of St. Louis, received an order last Saturday for two 42 x 48 inch Corliss engines for the Milwaukee plant of the Illinois Steel Company, which, together with other engine and general work in hand, assures them a very busy time for several months to come.

—We are advised that the contract for the feed water heaters and purifiers for the Columbia & Maryland Railway, the new electric line between Washington and Baltimore, now in the course of construction, with power houses at Ilchester and Paint Branch, 3,000 horse power each, has been awarded to the Harrison Safety Boiler Works of Philadelphia, Pa., for their Cochrane feed water heaters and purifiers.

—The New York Dredging Co. of New York, has secured the contract for the erection of the new drainage pumping plant in New Orleans, La. This plant is to lift 300 cu. ft. of drainage water per second, 12 ft. The company is to erect a complete drainage plant, consisting of buildings, water tube boilers, engines and pumps.

Miscellaneous.

—On Feb. 28, the speaker laid before the house a response from the secretary of war in reply to the resolution passed Feb. 11 directing him to furnish information and estimates relative to the cost of making a survey of the outlet of Lake Erie and other lakes and rivers. The chief of engineers repeats a former statement that a thorough investigation should extend over a sufficient time and eliminate accidental fluctuations and cover all stages, and may have to be continued several years. These surveys and investigations will cost approximately from $150,000 to $175,000.

—The Flint & Pere Marquette Railroad is planning to put steam shovels and other facilities into its elevator at Ludington, Mich., the coming season, so as to double its capacity in handling wheat. After these improvements are made it is claimed that it will be able to handle 10,000 bushels of grain per hour.

—The construction of a dam across the Tennessee river at Knoxville and the development of power, to be supplied to manufactories is proposed by John T. Wilder, of Johnson City, Tenn. Location for such a dam has been made and the plans completed, and the negotiations are now under way for the land necessary. A dam as proposed would command 20,000 horse power.

—The largest vessel ever built on the great lakes was launched Saturday, at the shipyards of the Globe Iron Works, Cleveland. The new steamer, which is being constructed for the Mutual Transportation Co. of that city, has not yet been named. Her measurements are: Length over all, 432 ft., width 41 ft. keel, 48 ft. beam and 28 ft. depth. Her net tonnage on an 18 ft. draught is 6,700 tons of ore or 200,000 bushels of wheat. With a 14 ft. draught she will carry 4,500 tons of ore. She was built in anticipiation of a 20 ft. channel. The engines are globe inverted cylinders triple expansion type, with cylinders 23, 39 and 63 by 42 in. She will have four Scotch type boilers 11½ ft. in diameter by 10 ft. in length.

—Arrangements are being made at Chattanooga, Tenn., to engage in the manufacture of the Barfield car coupler on a large scale.

—The Page Woven Wire Fence Co. has lately filled a 22 mile order from the Maine Central, and also sent a trial car load order to the Nashville Chattanooga & St. Louis. It has now over 100 regular railroad customers and thinks the demand from railroads will be unusually large this year. The 30 miles of fence put up for the Bangor & Aroostook Railroad in Maine, was completed just in time to escape the deep snow of that region.

—The Detroit White Lead Works were partially burned on Feb. 27. The loss is between $50,000 and $75,000; insurance $64,000. The fire was caused by the bursting of a pipe, the oil from which was ignited by a gas jet.

—The Ontario & Western Railroad Co. has under construction four coal barges, to be used for the New England and Sound business. Two of these barges will have a capacity of 1,500 tons and two of 750 tons.

—A company has been formed at Knoxville, Tenn., for the purpose of manufacturing a car coupler invented by Henry Raymond, of that city.

—The New York office of the Rand Drill Co. was on February 1, removed from 23 Park Place, to the American Surety Building, 100 Broadway.

—The National Air Brake Co., $500,000, with $10,000 paid in, has been organized at Jersey City, N.J., by Clarence F. McMurray, John J. Nef, Charles B. Bucklin of New York City; H. W. Meens of Jersey City, N. J.

—Circulars have been received announcing the passing of the regular dividend of 2 per cent on Michigan Peninsular preferred. On the other hand, checks have been received in payment of 1 per cent on the same stock, thus completing the payment of the first dividend passed.

—The Toledo Construction Co., Toledo, Ohio, reports business in the railway line as being very active. The company recently closed the following contracts: 20 miles of electric railway from Toledo, Ohio, to Petersburg, Mich.; 12 miles from Terre Haute, Ind., to Brazil, Ind.; 22 miles from Canton to Akron, Ohio, and 8 miles from New Philadelphia to Uhrichsville, Ohio. The company also has a contract to build 350 miles of steam railway in Alabama.